SOUTHEASTERN BYPASS ROUTING STUDY - PHASE I

DRAFT FINAL REPORT

Prepared for

Coachella Valley Association of Governments

Prepared by

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ES.0 EXECUTIVE SUMMARY

ES.1. Overview

The highway system in southeastern California has been developed to primarily serve east-west traffic, with three parallel interstate highways linking southern California with Arizona: Interstate 40, Interstate 10, and Interstate 8. North-south travel routes between these highways are few and far between, primarily because of topographic constraints and modest demand for north-south travel through this sparsely-developed region.

Changing patterns of travel in Southern California, resulting from rapid urbanization in the state and implementation of the North American Free Trade Agreement (NAFTA), necessitate re-evaluation of future transportation infrastructure needs in this area. The east-west orientation of the highway system does not conveniently serve the movement of people and goods which are not traveling to or from the major population centers of southern California (the greater Los Angeles and San Diego metropolitan areas). As a result, most trips moving in a northwest-southeast direction (for example, trips between Arizona and central/northern California, and trips between Mexicali and central/northern California) must pass through the greater Los Angeles metropolitan area to efficiently complete their trip. With increasing levels of traffic congestion in the urbanized areas, travel times for these long-distance trips become longer and less reliable, and these vehicles emit pollutants which worsen air quality in the highly polluted air basin.

Provision of a convenient alternate route around the metropolitan area could remove this long-distance traffic from the urbanized areas, thereby helping to reduce congestion and pollution. One route that has been discussed would link Mexicali with I-10 at Blythe (through the area currently served by SR-78), then northwesterly to connect with SR-62 at Rice and with I-40 at Ludlow. The northern part of this route (from I-10 to I-40) is the subject of this study. Through this area, a potential route has been identified that follows existing road rights-of-way, either dirt or paved.

The purpose of this study is to evaluate the feasibility of the proposed alignment of the Southeastern Bypass between Blythe and Ludlow. This includes identifying potential travel benefits, evaluating engineering feasibility and estimating construction costs, and examining potential impacts on the environment.

ES.2. Technical Approach

The study's technical approach was structured to utilize existing available data sources to analyze existing and future travel conditions, evaluate engineering feasibility and estimate construction costs, and identify potential environmental issues. Conceptual engineering and environmental analysis were conducted at a level of detail to support the evaluation of project feasibility. The evaluation supplemented available data sources with a field survey by members of the consultant team and the Technical Advisory Committee (TAC) which covered the entire length of the proposed alignment

and helped to validate the available information on existing conditions including topography and environmental constraints.

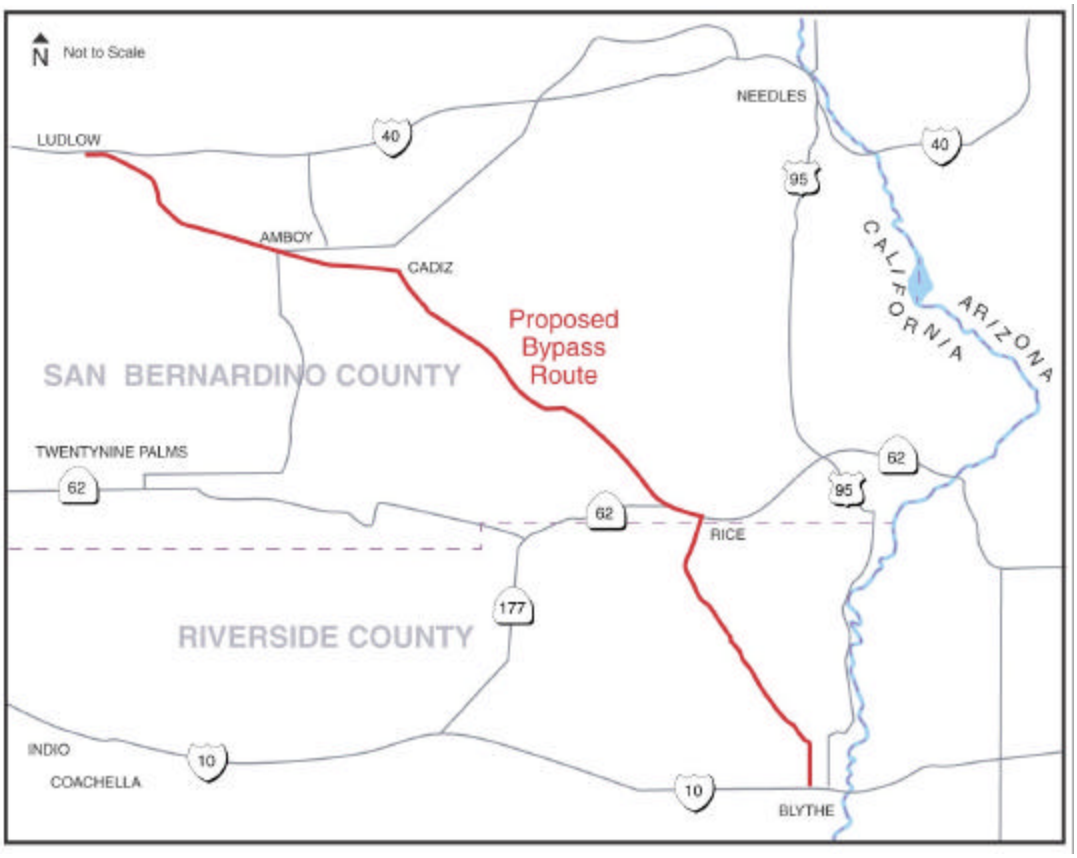
ES.3. Principal Findings

The following are major key findings listed under various tasks and elements of the The following sections present the key findings of each significant technical work element in the Southeastern Bypass Study:

ES.3.1. Existing and Future Travel Conditions

- The proposed alignment of the Bypass links the east-west freeways of I-10, SR-62, and I-40 diagonally in a northwest-southeast direction, as shown in Figure 1.1. The alignment is approximately 129 miles (206 kilometer (km)) long, and runs over generally flat desert terrain in eastern Riverside and San Bernardino Counties and in proximity to existing railroad tracks, underground utilities (natural gas pipe line), and overhead lines (telephone and high voltage transmission lines).

Figure ES.1 – Proposed Bypass Route



- The alignment presently consists of 58 miles (92 km) of paved two-lane roadway and 71 miles (114 km) of unpaved roadway that is roughly graded with native gravel, wide enough for two lanes and mainly used by service vehicles.

- It connects the City of Blythe on the south at the I-10 freeway with the town of Ludlow on the north at the I-40 freeway, passing through or near the small (or uninhabited) communities of Midland, Rice (at SR-62), Iron Mountain Pumping Plant (5 km north of SR-62), Cadiz (at the junction of the Arizona-California and the BNSF railroads tracks), Chambless and Amboy (at the National Trails Highway, previously US Route 66).

- There is an existing county-maintained two-lane paved road, named Kelbaker Road, which runs in the north-south direction and connects I-40 with former US-66 east of Amboy. This offers a more direct connection to I-40 than the proposed alignment along former US-66 through Amboy and Ludlow.

- The existing traffic volume on the Bypass is insignificant. The paved sections of road between Blythe and Midland and between Cadiz and Ludlow carry more traffic than the unpaved sections.

- Long-distance trips traveling in a northwest-southeast direction use the increasingly-congested I-10 and I-15 freeways to pass through the Coachella Valley, Banning Pass area, Redlands/San Bernardino area, and Cajon Pass.

- Forecasts of future trends for Southern California indicate continuing substantial growth in population, accompanied by corresponding increases in the movement of people and goods that will cause more congestion on the freeway system, increase travel delays and costs, increase vehicle crashes, and worsen air quality.

- It is anticipated that the Study Area will experience a significant increase in truck volume due a combination of population growth in the area, increased trade between the U.S. and Mexico, and anticipated increase of goods movements across the Southwest Passage, the transportation system linking Southern California with Arizona, New Mexico, and Texas.

- To effectively mitigate these negative traffic trends, transportation agencies are adopting and implementing improvement strategies that include capacity increases on roadways and highways as well as traffic demand management.

- The proposed Bypass has the potential to contribute to both types of improvement (increasing roadway capacity and redistributing traffic) by:

    - Providing a cost effective roadway capacity increase.
    - Diverting traffic away from congested urbanized areas.
    - Providing long-distance trips traveling in the northwest-southeast direction with a decrease in travel time and increase in safety.
    - Providing a relatively flat roadway through the Mojave Desert that is conveniently connected to the freeway system.
    - Providing a new road through an area that will attract recreational travel.
    - Increasing economic development opportunities, adding to the value of future developments and services in the study area.

- Providing an alternate north-south route in emergencies and during controlled closures for maintenance or construction activities.

ES.3.2. Travel Benefits of the Diversion

- The Bypass would reduce existing and future travel times for trips between Blythe and Barstow, the Victor Valley (Victorville/Apple Valley), the Antelope Valley (Lancaster/Palmdale), and northern/central California.

- The Bypass would attract between 1,100-3,200 vehicles daily in its opening year, and 1,700-6,700 vehicles daily by 2025. This volume of traffic would be eliminated from I-10 through Banning Pass and I-15 through Cajon Pass.

- Vehicle pollutant emissions would be reduced as follows:
  - Carbon monoxide: .14-.43 tons/year in the opening year, .21-90 tons/year in 2025
  - Nitrous oxides: .21-.65 tons/year in the opening year, .29-1.35 tons/year in 2025
  - Volatile organic compounds: .02-.07 tons/year in the opening year, .03-.14 tons/year in 2025
  - Particulate matter: .01-.04 tons/year in the opening year, .02-.09 tons/year in 2025

- Vehicle fuel consumption would be reduced by 3,200-9,800 gallons per year in the opening year and by 4,600-20,300 gallons per year in 2025.

ES.3.3. Feasibility and Costs

- The estimated cost of constructing the Bypass over an existing paved and unpaved roadway is approximately $107 million.

- The Bypass will construct 85 miles of new two-lane roadway, utilize or upgrade 44 miles of existing paved roadways, and upgrade existing drainage structures along the National Trails Highway to allow truck traffic to travel over it and remove the posted weight restrictions.

- The right-of-way cost is not included in the construction cost estimate, because of the unavailability of ownership data at this planning stage. Any needed right-of-way would involve a relatively low cost because the adjacent land is vacant uninhabited desert land.

- The cost of constructing a lane-mile of this Bypass was estimated to equal to $0.65 million.

- The Bypass improvements involve a relatively low per-mile cost. The average cost of other recent highway improvements in Southern California are listed for comparison:
  - SR-210 improvements: $ 4.87 per lane-mile
  - SR-60 improvements: $ 1.00 per lane-mile
  - I-10 improvements: $ 5.5 per lane-mile

- SR-70 improvements: $ 2.56 per lane-mile

- The construction of the Bypass will not impact existing traffic during the construction period, because most of its alignment runs over existing unpaved roadway with no traffic. Standard Traffic Handling plans will be needed at the drainage structures improvements sites on the National Trails Highway and at the intersections with existing paved roads.

- In summary the construction of the Bypass does not have any engineering constraints, nor will it adversely impact existing traffic. It would provide a link between I-10, SR-62, and I-40 over a two-lane roadway in a flat terrain designed to allow vehicles to travel safely all year around avoid congested freeways and high elevation terrain.

ES.4 Environmental Analysis

Based on the results of the environmental analysis, the prominent environmental concerns within the project area would include potential impacts to Biological Resources, Hazards and Hazardous Materials and Hydrology and Water Quality. Lesser environmental concerns within the project area would include potential impacts to Land Use and Planning. Potential environmental benefits result from the development of the proposed project to Population and Housing as well as Recreation.

ES.4.1.1. Prominent Environmental Concerns

- Biological Resources. Potential biological resource impacts would include the expansion of the project alignment into habitats belonging to the Desert Tortoise, LeConte's Thrasher and Crucifixion Thorne and indirect impacts to Nelson's Bighorn Sheep. Additional potential biological impacts may arise with respect to the traversing and/or conversion of California Department of Fish and Game (CDFG) jurisdictional blue-line streams.

- Hazards and Hazardous Materials. Potential hazards and hazardous materials impacts would include: construction related breaching of an adjacent gas-line that under-crosses an unpaved portion of the project; operational hazards related to controlled and uncontrolled rail crossings and roadway intersections; on-going transport of hazardous materials by vehicles utilizing the project; and potential hazards related to project-adjacent oil tanks.

- Hydrology and Water Quality. Potential hydrology and water quality impacts would include project related development or retrofitting of stream over-crossings, thereby affecting drainage.

ES.4.1.2. Lesser Environmental Concerns

- Land Use and Planning. Potential land use and planning impacts would include CDFG permitting issues related to blue-line streams and conflicts with natural community conservation plans, including an in-process habitat conservation plan.

ES.4.1.3. Potential Environmental Benefits

- Population and Housing. Beneficial population and housing impacts may include an improved economic condition afforded by increased roadway traffic to project-adjacent business, thereby increasing their economic ability.

- Recreation. Beneficial recreation impacts may include the improved access to the Bureau of Land Management (BLM) Midland Long-Term Visitor Area.

ES.5 Conclusions

The Southeastern Bypass Study revealed that the recommended alignment that connects the three east-west highways (I-10, SR-62, and I-40) between Blythe and Ludlow is:

- **Feasible** because it follows an existing road alignment over relatively flat terrain with minimal engineering constraints, and at this stage there do not appear to be any major environmental constraints. It is anticipated that any potentially significant impacts could likely be mitigated to a level below significance. It is not possible to determine the costs of potential mitigation measures at this stage of project development.
- **Useful** because it would attract traffic away from the Coachella Valley and congested freeway system in western Riverside and San Bernardino Counties.
- **Cost Effective** because it will be constructed mainly over existing right-of-way with flat terrain in an uninhabited area. Its unit cost would be less than other roadway capacity improvements.
- **Beneficial** because it will help in reducing congestion and air pollution in the eastern part of the greater Los Angeles metropolitan area. It could be used as a bypass of the metropolitan area in emergencies and during construction periods of adding roadway capacity to the existing freeways.

It is recommended that the Southeastern Bypass Route be adopted by CVAG and SANBAG, so that subsequent steps, including design and environmental documentation, can be undertaken.

1.0 INTRODUCTION

1.1. Overview

The highway system in southeastern California has been developed to primarily serve east-west traffic, with three parallel interstate highways linking southern California with Arizona: Interstate 40, Interstate 10, and Interstate 8. North-south travel routes between these highways are few and far between, primarily because of topographic constraints and modest demand for north-south travel through this sparsely-developed region.

Changing patterns of travel in Southern California, resulting from rapid urbanization in the state and implementation of the North American Free Trade Agreement (NAFTA), necessitate re-evaluation of future transportation infrastructure needs in this area. The east-west orientation of the highway system does not conveniently serve the movement of people and goods which are not traveling to or from the major population centers of southern California (the greater Los Angeles and San Diego metropolitan areas). As a result, most trips moving in a northwest-southeast direction (for example, trips between Arizona and central/northern California, and trips between Mexicali and central/northern California) must pass through the greater Los Angeles metropolitan area to efficiently complete their trip. With increasing levels of traffic congestion in the urbanized areas, travel times for these long-distance trips become longer and less reliable, and these vehicles emit pollutants which worsen air quality in the highly polluted air basin.

Provision of a convenient alternate route around the metropolitan area could remove this long-distance traffic from the urbanized areas, thereby helping to reduce congestion and pollution. One route that has been discussed would link Mexicali with I-10 at Blythe (through the area currently served by SR-78), then northwesterly to connect with SR-62 at Rice and with I-40 at Ludlow. The northern part of this route (from I-10 to I-40) is the subject of this study. Through this area, a potential route has been identified that follows existing road rights-of-way, either dirt or paved.

The purpose of this study is to evaluate the feasibility of the proposed alignment of the Southeastern Bypass between Blythe and Ludlow. This includes identifying potential travel benefits (Chapter 2), evaluating engineering feasibility and estimating construction costs (Chapter 3), and examining potential impacts on the environment (Chapter 4).

2.0 TRAVEL BENEFITS

The purpose of this chapter is to evaluate the potential travel benefits of constructing the Southeast bypass. It includes documentation of existing traffic volumes in the study area, an assessment of potential trip origins and destinations which could benefit from construction of the bypass, estimates of potential traffic volumes on the bypass road, and estimates of potential emission reductions and energy consumption savings resulting from the bypass.

2.1. Existing Traffic Volumes

The study area considered in this evaluation encompasses the Eastern portion of the California Mojave Desert. The bypass route itself would extend northwesterly from Blythe on Interstate 10 (I-10) to Interstate 40 (I-40) near Ludlow. The state highway system in this area is depicted on **Figure 2.1**, which also shows existing (Year 2001) average daily traffic (ADT) volumes on the state highway system, including total traffic volumes and heavy-duty truck volumes (3+ axle).

2.2. Potential Bypass Users

Travelers who could potentially use the bypass are those traveling through southeastern California in a generally northwest-southeast direction, whose trip origins and destinations do not include the metropolitan Los Angeles or San Diego areas. In general, this would involve trips traveling between southeastern California and northern or central California.

To determine which trip markets could benefit from the bypass, existing and future travel times were calculated between trip origins and destinations crossing the study area. Travel times were calculated between Blythe and eight destinations, and between Calexico and the same eight destinations (see **Table 2.1** and **Figure 2.2**). Travel times on the portions of trips passing through the metropolitan Los Angeles area were estimated using the Southern California Association of Governments (SCAG) regional travel demand forecasting model. Since travel times through the metropolitan area are longer during peak periods due to traffic congestion, travel times were estimated for both the midday and afternoon peak periods. For portions of the trips outside the LA metro area, travel on Interstate highways was assumed to be 65 miles per hour (mph), consistent with the regional model's free-flow freeway speed, and the travel speed on non-interstate highways (including the Bypass) was assumed to be 45 mph, consistent with rural highways in the model. This is a conservatively low travel speed estimate for the Bypass, since it will cross few intersecting routes and minimal cross-traffic, except in Blythe. Since the Bypass is not expected to experience congestion, travel times using the Bypass are the same in 2001 and 2025 and in both Midday and PM peak periods.

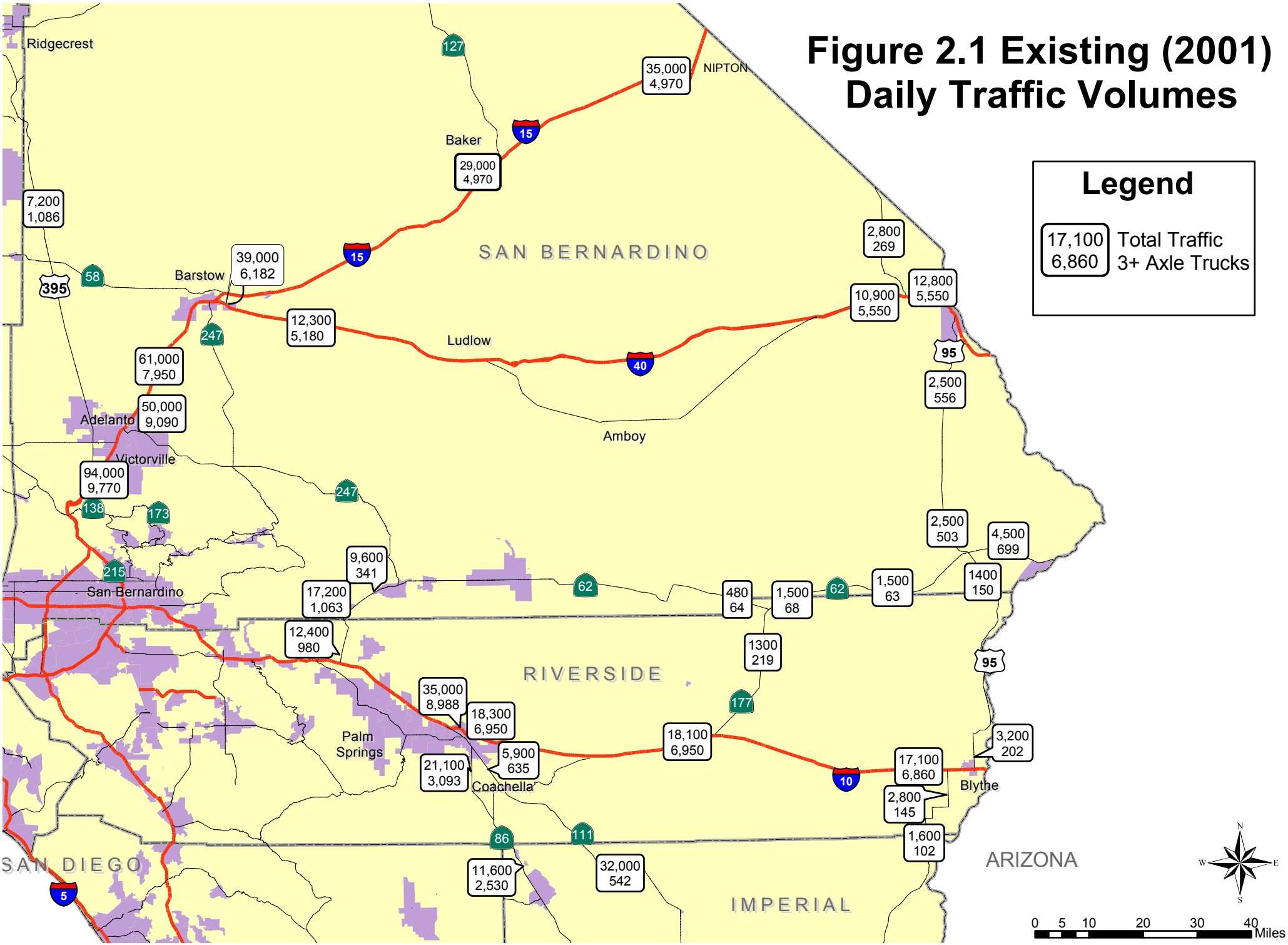


Figure 2.1 Existing (2001)
Daily Traffic Volumes
Legend
17,100
6,860
Total Traffic
3+ Axle Trucks
Ridgecrest
Baker
NIPTON
Barstow
Ludlow
Amboy
Adelanto
Victorville
San Bernardino
Palm Springs
Coachella
Blythe
SAN BERNARDINO
RIVERSIDE
SAN DIEGO
IMPERIAL
ARIZONA
7,200
1,086
35,000
4,970
29,000
4,970
39,000
6,182
12,300
5,180
61,000
7,950
50,000
9,090
94,000
9,770
2,800
269
12,800
5,550
10,900
5,550
2,500
556
2,500
503
4,500
699
1400
150
1,500
63
1,500
68
480
64
9,600
341
17,200
1,063
12,400
980
1300
219
35,000
8,988
18,300
6,950
5,900
635
21,100
3,093
18,100
6,950
3,200
202
17,100
6,860
2,800
145
1,600
102
11,600
2,530
32,000
542
0 5 10 20 30 40 Miles

Figure 2.2 Regional Context

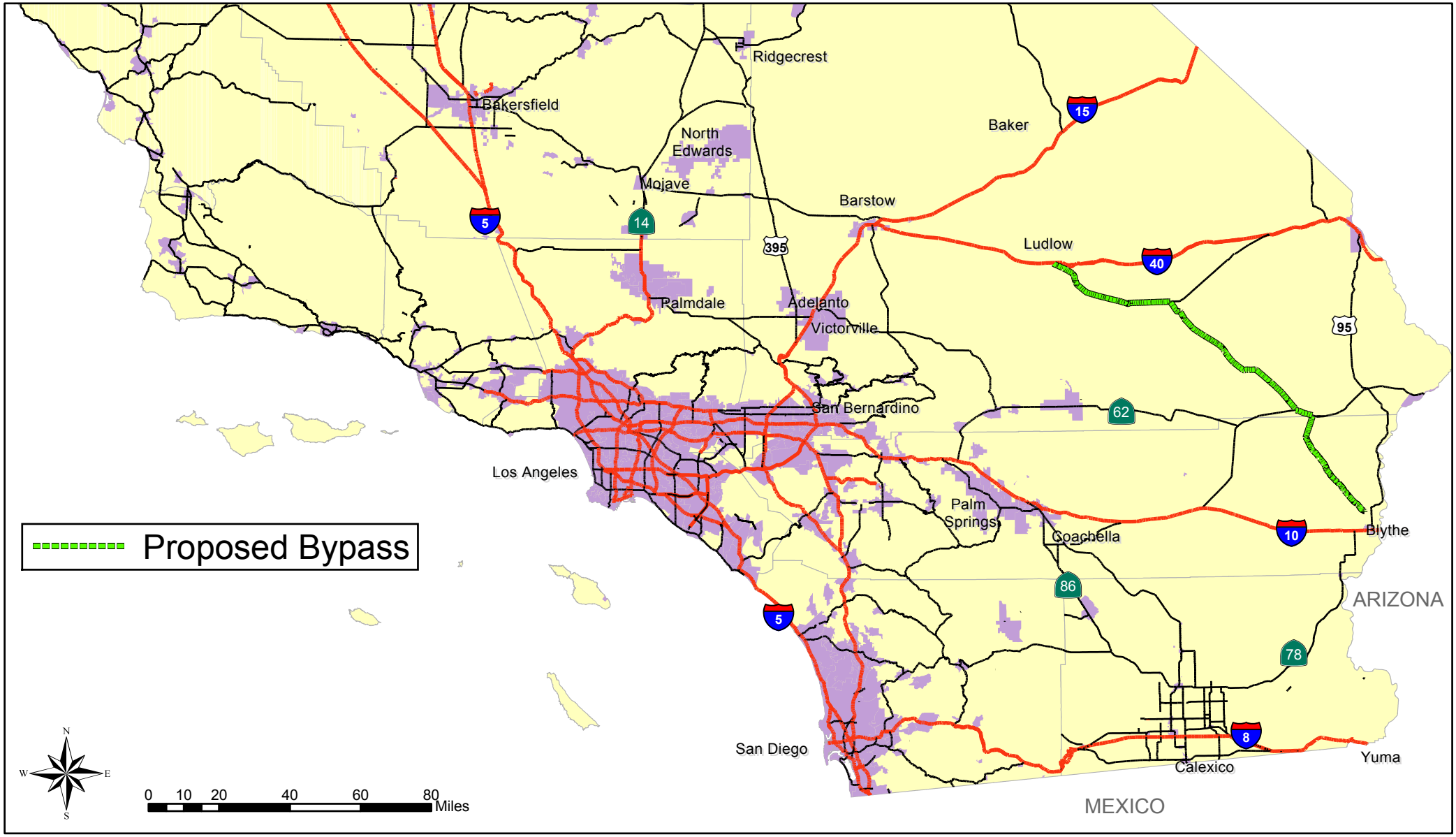


Table 2.1 – Southeast Bypass Travel Time Comparison

Origin	Destination	Freeflow		2001 Travel Time		2025 Travel Time		2001 and 2025 Travel Time using Bypass	
		Distance	Time	Midday	PM	Midday	PM	Midday	PM
		miles	min	min	min	min	min	min	min
Blythe	Bakersfield	323	301	347	397	398	517	392	392
	Lancaster/Palmdale	252	248	275	303	354	443	338	338
	Mojave	248	243	270	297	348	438	338	338
	North Edwards	238	242	261	279	337	435	296	296
	Ridgecrest	250	260	280	298	347	443	303	303
	Barstow	259	254	272	285	383	498	278	278
	Baker	262	249	267	280	386	530	275	275
	Victorville/Apple Valley	203	192	209	222	290	359	215	215
Calexico	Bakersfield	328	336	376	426	429	548	531	531
	Lancaster/Palmdale	350	283	304	332	384	474	477	477
	Mojave	254	278	299	327	379	469	477	477
	North Edwards	244	276	290	308	368	493	435	435
	Ridgecrest	256	295	309	301	378	502	442	442
	Barstow	265	289	301	315	414	530	407	407
	Baker	267	283	296	309	431	561	405	405
	Victorville/Apple Valley	208	226	238	251	320	391	301	301

Table 2.1 shows the distance and travel time comparisons. The following trips to/from Blythe would have a shorter travel time using the Bypass:

- Blythe to Bakersfield (2001 PM and 2025)
- Blythe to Lancaster/Palmdale (2025)
- Blythe to Mojave (2025)
- Blythe to North Edwards (2025)
- Blythe to Ridgecrest (2025)
- Blythe to Barstow (2001 PM and 2025)
- Blythe to Baker (2001 PM and 2025)
- Blythe to Victorville (2001 PM and 2025)

Travel times to/from Calexico assume an average 45 mph speed on the route (SR-78) between Calexico and Blythe as well as on the Bypass. The following trips to/from Calexico would have a shorter travel time using the Bypass:

- Calexico to Bakersfield (2025 PM)
- Calexico to North Edwards (2025 PM)
- Calexico to Barstow (2025)
- Calexico to Baker (2025)
- Calexico to Victorville (2025)

2.3. Estimated Bypass Traffic Volumes

A previous study (*'Eastern Southern California Bypass Corridor', Jack Faucett Associates, 2001*) estimated potential usage of the Bypass. That study found that trips between Blythe and northern/central California, and trips between Yuma and northern/central California would be likely to use the Bypass because of the shorter travel time. It used existing (1998) ADT, combined with O-D survey data from trucks on I-10, to estimate the volume of daily trips which would use the Bypass now and in the future. (The estimates and their derivation are displayed in **Table 2.2**.) The estimated ADT on the Bypass was 2,100-2,700 in 1998 and 3,500-4,600 in 2020.

Table 2.2 – Jack Faucett Bypass Road Usage Estimates (I-10 to I-40)

Low Scenario

Origin	Destination	Type	Existing Year	Existing ADT	% of traffic to destination	Notes	Est. 1998 Daily Volume on Bypass	Growth Factor to Future Year	Notes	Est. Future Year Volume on Bypass	Future Year
Blythe	North/Central California	Autos	1998	9300	9.0%	1	837	1.14	a	955	2020
Blythe	North/Central California	Trucks	1998	5900	12.0%	2	708	2.09	a	1,479	2020
Yuma	North/Central California	Autos	1998	10180	2.5%	3	255	1.87	a	477	2020
Yuma	North/Central California	Trucks	1998	2624	12.5%	3	328	1.92	a	630	2020
							2,128			**3,540**	

High Scenario

Origin	Destination	Type	Existing Year	Existing ADT	% of traffic to destination	Notes	Est. 1998 Daily Volume on Bypass	Growth Factor to Future Year	Notes	Est. Future Year Volume on Bypass	Future Year
Blythe	North/Central California	Autos	1998	9300	9.0%	1	837	1.14	a	955	2020
Blythe	North/Central California	Trucks	1998	5900	12.0%	2	708	2.09	a	1,479	2020
Yuma	North/Central California	Autos	1998	10180	5.0%	3	509	1.87	a	953	2020
Yuma	North/Central California	Trucks	1998	2624	25.0%	3	656	1.92	a	1,260	2020
							2,710			**4,647**	

Notes on Traffic Destination Percentages

1 truck survey data, reduced by 25% (Jack Faucett Associates)

2 truck survey data (Jack Faucett Associates)

3 truck survey data, reduced by 50% (Jack Faucett Associates)

Notes on Growth Factors

a Jack Faucett Associates

Since the completion of the Faucett study, some additional information became available to update the traffic estimates in the form of the updated SCAG regional travel demand model. The SCAG model data provided information about origins and destinations of traffic entering the model area on I-10 (east of Coachella) and on SR-86 (south of Coachella). With updated ADT counts and O-D data for auto trips, a refined estimate of Bypass traffic was possible.

The previous section listed the trip patterns which could have reduced travel times with the Bypass. The SCAG O-D data revealed that there is no demand for most of these trips, and that the only O-D pairs for which demand exists are Blythe to northern/central California and Blythe to Lancaster/Palmdale. The SCAG truck O-D data (which were based on surveys) show a much higher percentage of I-10 truck traffic traveling to/from northern California than the Faucett data (which were also based on surveys), so the differing percentages were applied to develop a high and a low estimate of Bypass traffic.

In addition, the Faucett traffic estimate included traffic to/from Yuma, since that study was evaluating a Bypass route all the way from the Imperial Valley through Blythe and up to I-40. Since this study evaluates only the feasibility of the northern portion of the Bypass (from I-10 to I-40), the low traffic estimate excludes Yuma-to-central California traffic. The high traffic estimate includes this Yuma traffic at the same level estimated in the Faucett study, on the premise that these trips would travel through Blythe instead of Yuma if the Bypass was available.

Table 2.3 shows the derivation of estimated Bypass traffic, based on the assumptions described above. The estimated 2002 ADT volume on the Bypass ranges from 1,100-3,200, and the estimated 2025 ADT is 1,700-6,700. The greater range in the high-low estimates (compared to the Faucett estimates) is caused by: (1) the difference in truck O-D data on I-10 between SCAG data and the Faucett data; and (2) inclusion of Yuma trips in the high estimate.

From this analysis, it can be concluded that an extremely conservative estimate of Bypass traffic would be 1,100 trips per day in the project opening year and 1,700 trips per day in 2025, with a conservative potential to carry 1,700 trips per day upon opening and 3,000 trips per day in 2025. Thus, there would be a direct benefit in travel time saved to these users.

On today's highway system, most of the traffic projected to use the Bypass would travel on I-10 through Banning Pass and I-15 through Cajon Pass, freeways on which the existing and projected future traffic volumes exceed the available capacity of the roadway. Construction of the Bypass would therefore not only benefit the motorists who would use it as a shorter travel route, it would also help to relieve some of the excessive traffic volumes on key freeway links in the metropolitan Los Angeles highway system.

Table 2.3 – Updated Bypass Road Usage Estimates (I-10 to I-40)

Low Scenario

Origin	Destination	Type	Existing Year	Existing ADT	% of traffic to destination	Notes	Est. 1998 Daily Volume on Bypass	Growth Factor to Future Year	Notes	Est. Future Year Volume on Bypass	Future Year
Blythe	North/Central California	Autos	2001	10240	2.2%	4	225	2.39	b	538	2025
Blythe	North/Central California	Trucks	2001	6860	12.0%	2	823	1.37	c	1,124	2025
Blythe	High Desert	Autos	2001	10240	0.2%	4	19	2.39	b	46	2025
Blythe	High Desert	Trucks	2001	6860	0.1%	5	7	1.37	c	9	2025
Yuma	North/Central California	Autos	2001	10180	0.0%	5	0	1.87	a	0	2025
Yuma	North/Central California	Trucks	2001	2624	0.0%	5	0	1.92	a	0	2025
							1,075			**1,719**	

High Scenario

Origin	Destination	Type	Existing Year	Existing ADT	% of traffic to destination	Notes	Est. 1998 Daily Volume on Bypass	Growth Factor to Future Year	Notes	Est. Future Year Volume on Bypass	Future Year
Blythe	North/Central California	Autos	2001	10240	2.2%	4	225	2.39	b	538	2025
Blythe	North/Central California	Trucks	2001	6860	33.3%	4	2,284	2.09	a	4,772	2025
Blythe	High Desert	Autos	2001	10240	0.2%	4	19	2.39	b	46	2025
Blythe	High Desert	Trucks	2001	6860	1.4%	4	93	2.09	a	193	2025
Yuma	North/Central California	Autos	2001	10180	2.5%	3	255	1.87	a	477	2025
Yuma	North/Central California	Trucks	2001	2624	12.5%	3	328	1.92	a	630	2025
							3,204			**6,657**	

Notes on Traffic Destination Percentages

2 truck survey data (Jack Faucett Associates)

3 truck survey data, reduced by 50% (Jack Faucett Associates)

4 SCAG Regional Model

5 Estimated

Notes on Growth Factors

a Jack Faucett Associates report

b SCAG Regional Model

c SCAG Regional Model (total regional truck growth)

2.4. Emission Reduction and Energy Savings

The construction of a bypass would route reduce fuel consumption and improve air quality, since the bypass would reduce the travel distance by 23 miles between Blythe and North/Central California. For the purpose of this study, three measures were applied to estimate energy and air quality benefits:

- Change in Criteria Pollutant and Precursor Emissions
- Change in Greenhouse Gas Emissions
- Change in Regional Energy Consumption

These indicators were calculated using the Federal Transit Administration's (FTA) sample worksheet found in *'Reporting Instructions for Section 5309 New Starts Criteria, July 2001'*. This calculation included carbon monoxide (CO), particulate matter (PM_{10}), nitrogen oxides (NO_X), and volatile organic compounds (VOC), the latter two being precursors of ozone. The greenhouse gas emission was measured in carbon dioxide (CO_2). Change in regional energy consumption was also calculated as a gauge to estimate environmental gains. Although the change is measured in British Thermal Units (BTUs), for the purpose of this study the energy saved is presented in terms of gallons of automobile and truck fuel saved. FTA calculates the change in pollutant emission and energy savings based on Vehicle Mile Traveled (VMT) estimates and standard energy consumption rates for available fuel types. Emission factors for CO, NO_X, VOC and PM_{10} were obtained from EMFAC7G. The factors used for this calculation were derived assuming that vehicles using the Bypass will traverse it at a conservative speed of 45 mph. **Table 2.4** summarizes the findings. Details of calculation and sources for various data used for the calculation can be found in **Appendix 6.1** and **Appendix 6.2.**

Table 2.4 – Estimates of Annual Emission Reduction and Energy Savings

		Annual Reduction with Bypass					
		Annual Emission (tons per year)				Annual Gasoline Consumption (gallons per year)	Annual CO2 Emission (tons per year)
		CO	NOx	VOC	PM-10		
2001	low	0.14	0.21	0.02	0.01	3,188	35
	high	0.43	0.65	0.07	0.04	9,820	107
	average	0.29	0.43	0.04	0.03	6,504	71
2025	low	0.21	0.29	0.03	0.02	4,613	50
	high	0.90	1.35	0.14	0.09	20,329	221
	average	0.55	0.82	0.08	0.05	12,471	135

It can be seen from **Table 2.4** that on an average more than 6,000 gallons of gasoline / diesel fuel would be conserved annually if the bypass was in place today. This estimate doubles to more than 12,000 gallons of annual savings in fuel consumption by 2025. The results also show that using the Bypass will reduce the dissemination of other pollutants.

3.0 FEASIBILITY ASSESSMENT AND ESTIMATE COST

The objective of this chapter is to examine the feasibility of the proposed bypass, identify potential physical constraints, and estimate the costs associated with the proposed improvements.

To fulfill the purpose of this work element, the Consultant conducted the following tasks:

1. Developed typical section and description of the preferred bypass route.
2. Portrayed a "footprint" alignment along existing road rights-of-way using available base mapping.
3. Identified physical constraints and engineering issues.
4. Developed a planning-level cost estimate.

The first step was taken to develop a general physical description of the proposed bypass facility based on Caltrans standards and Year 2025 traffic volumes that are anticipated to use this bypass as forecasted in Chapters 2 of this study.

The existing roadway configuration and conditions were also examined by viewing the USGS maps and by conducting a field trip driving over the entire proposed alignment of the bypass. Typical cross-sections were developed to characterize the physical dimensions of the facility including inputs from public agencies and the trucking industry.

Using the typical section, a "footprint" for the bypass was developed and applied to the base mapping by following existing rights-of-way and seeking to avoid any sensitive social, cultural, and natural resources. As part of this effort, major engineering issues and potential physical constraints associated with development of the proposed bypass were noted and discussed below.

A planning-level cost estimate for the project in current year dollars (2003) was prepared based on the construction cost of typical section per centerline mile. The cost per centerline mile was drawn from estimates developed by the consultant for other similar projects, adjusted to reflect conditions in the project area.

The cost estimate encompassed items such as earthwork, asphalt/pavement, drainage, specialty items, and traffic handling. Unit costs were developed for major structures such as bridges and culverts, and then applied on a lump sum basis. Percentage add-ons such as administrative expense, environmental studies, design, mobilization, and utility relocation as well as a contingency percentage appropriate for this level of planning were included in the cost estimates. The cost of right-of-way is not included in the construction cost estimate because comprehensive ownership data are not available at this stage of planning. Any needed right-of-way would involve a relatively low cost because the adjacent land is vacant uninhabited desert land.

3.1. Description of Proposed Bypass Route

Traveling from south to north, the proposed route runs from Blythe at I-10 to Ludlow at I-40 following existing paved and unpaved roadways to provide a diagonal bypass that connects the three east-west highways in the study area, namely I-10, SR-62, and 1-40 (See **Figure 3.1**).

This feasibility study will examine the proposed bypass alignment starting from Midland Road at 4th Avenue and ending at Ludlow interchange with I-40. Kelbaker Road from the National Trails Highway to I-40 will be discussed as a short cut to reach I-40 east of Ludlow.

(Note: All roadway lengths are in Miles and are approximate. They were measured from the USGS maps and checked for validation with measurements shown on AAA maps of Riverside and San Bernardino Counties.)

The alignment can be divided into four segments. The first two segments fall within the County of Riverside while the second two segments fall within the County of San Bernardino.

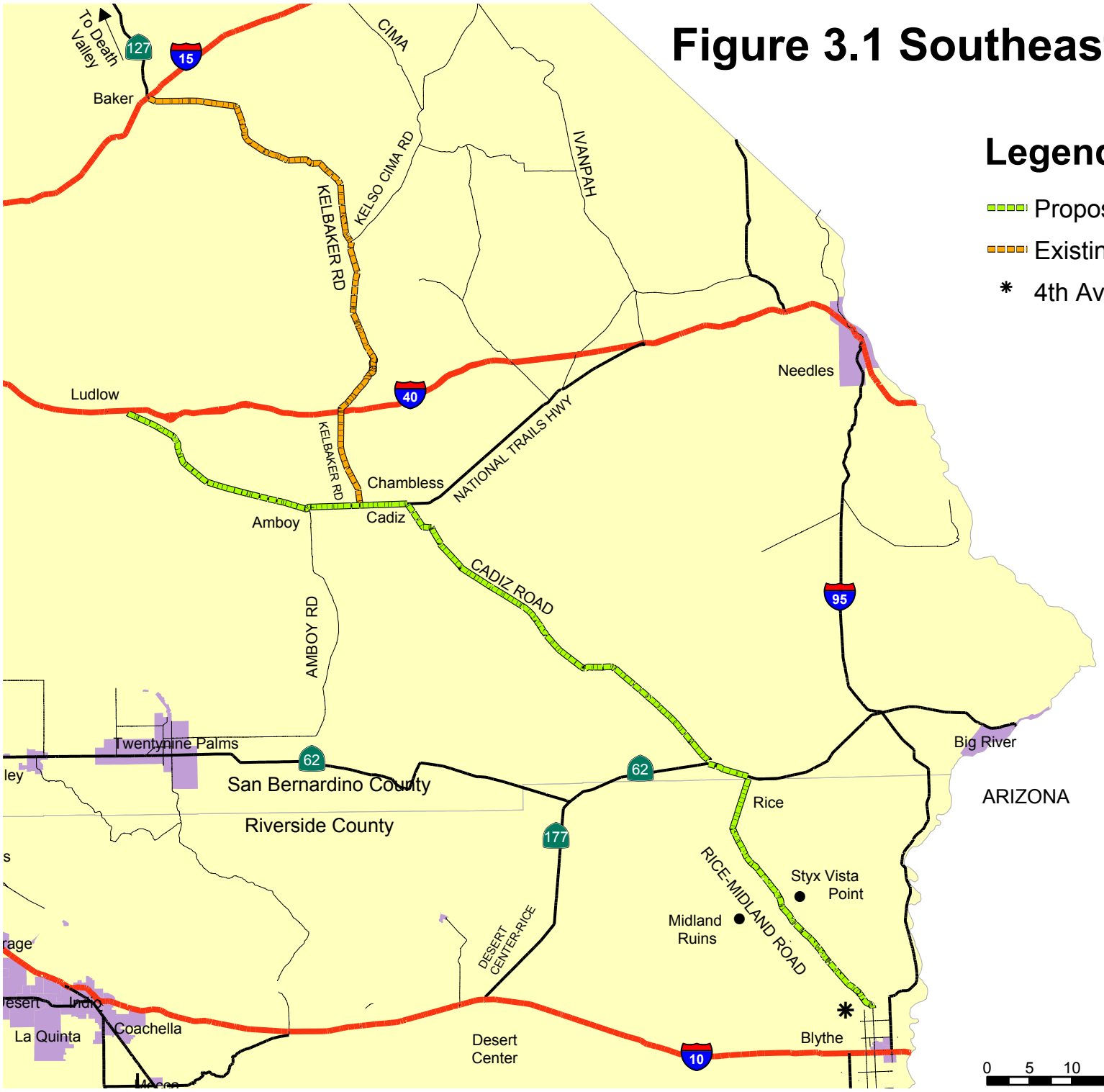
The **First Segment** stretches in the northwest direction for 14 miles over Midland Road, an existing 2-lane paved roadway, starting from 4th Avenue north of the inhabited area of Blythe to a fork near the town of Midland (ruins).

Along this stretch of roadway the land is gradually climbing, arid, and barren but soil is suitable for base aggregates. The tracks of Arizona-California Rail lie to the west of the roadway with an at-grade crossing (RR crossing No. 1) one mile north of 4th Avenue. Overhead utility lines are visible on the east side and an underground pipe (Gas Line) is marked along the east side of the roadway.

The **Second Segment** stretches in the northwest direction for 21 miles over Rice-Midland Road, an existing unpaved road graded to a width of two-lane roadway, starting from the north end of the paved Midland Road to SR-62 at Rice (apparently uninhabited settlement with old dilapidated buildings).

The land for the first five miles of this stretch is a continuation of the first segment. At the end of this five miles is a vista point that looks over the relatively flat desert land to the north with high mountains to the east and west.

Figure 3.1 Southeastern Bypass Route



Legend

- Proposed Alignment of Bypass Route
- Existing Kelbaker Road
- * 4th Avenue- Start of Bypass

Segments of the Bypass

First Segment: 14 miles over Midland Road (paved)

Second Segment: 21 miles over Rice-Midland Road to Rice at SR-62 (unpaved)

Third Segment: 4 miles along SR-62 (paved) and 50 miles over Cadiz Road to Chambless at the National Trails Highway (unpaved)

Fourth Segment: 11 miles between Chambless and Amboy and 29 miles between Amboy and Ludlow at I-40 over the National Trails Highway (paved)

Kelbaker Road: 11 miles to I-40 and additional 56 miles to I-15 (paved)

From the vista point the unpaved roadway drops approximately fifty feet with a steep slope to a flat desert land with sandy soil. It continues in this flat desert terrain in a generally northwest direction until it reaches Rice at SR-62. The flat topography and the sandy soil represent a drainage issue that will be addressed later in this chapter.

The tracks of Arizona-California Rail cross the unpaved roadway with an at-grade crossing (RR crossing No. 2) near the vista point and lie to the east of the roadway until they cross it again one mile south of SR-62 (RR crossing No. 3). They run for a short distance to the west of the roadway, and cross SR-62 twice (RR crossing No.4 and RR crossing No.5) to create a "y" connection with other railroad tracks that lie north of SR-62 coming from the east direction.

The underground pipe (Gas Line) follows along the east side of the roadway, and crosses it approximately seven miles south of SR-62, and continues to run along the west side of the roadway.

The **Third Segment** stretches in the west direction for 4 miles over SR-62, an existing 4-lane paved highway, and then it continues in the northwest direction for 50 miles over Cadiz Road, an existing unpaved road graded to a width of two-lane roadway, until it meets the National Trails Highway (previously known as Route 66), an existing 2-lane paved road, at the town of Chambless. It passes the town of Cadiz three miles south of the junction; these final three miles of Cadiz Road are two-lane paved roadway.

Along this stretch of roadway the land is flat desert land with sandy soil. The unpaved roadway passes along the Danby Dry Lake and Cadiz Sand Dunes. The flat topography and the sandy soil represent a drainage issue that will be addressed later in this chapter.

The tracks of Arizona-California Rail lie to the east of the roadway with an at-grade crossing (RR crossing No. 6) 5 miles south of Cadiz. The tracks of BNSF Rail coming from the east cross the roadway with an at-grade crossing (RR crossing No. 7) and meet the tracks of the Arizona-California Rail line west of the roadway and south of Cadiz.

The underground pipe (Gas Line) is marked along the west side of the roadway until it crosses the National Trails Highway at the town of Amboy.

The **Fourth Segment** stretches to the west for 11 miles over the National Trails Highway, an existing 2-lane paved county road, from Chambless to Amboy, and then it continues in the northwest direction for 29 miles over the National Trails Highway from Amboy to Ludlow where it links with I-40 at the Ludlow interchange.

Signs posted along the side of the road prohibit heavy trucks from driving over this stretch of the National Trails Highway. The reason for this restriction is the strength of the old drainage bridges along this stretch of the highway. These structures are not strong enough to carry heavy trucks. To utilize this stretch of the existing road as part of the Bypass, the drainage structures must be upgraded to carry the load of heavy trucks.

The tracks of the BNSF Rail line coming from the east cross the roadway with an at-grade crossing (RR crossing No. 8) at Amboy and cross it again (RR crossing No. 9) 3 miles east of Ludlow.

The underground pipe (Gas Line) is marked along the west side of the roadway until it crosses the National Trails Highway at the town of Amboy, and continues parallel to the rail tracks north of the roadway.

Kelbaker Road is a 2-lane paved county roadway that runs for 11 miles in the north-south direction connecting the National Trails Highway at a point five miles west of Chambless with I-40 at Kelbaker interchange. This existing roadway creates a shorter route for travelers destined to I-40, compared to following the National Trails Highway to Ludlow.

Kelbaker Road presents an alternative to shorten the length of the Bypass and avoid upgrading the existing drainage structures at the National Trails Highway. This, in turn, would reduce the cost of the bypass, as will be shown later in this chapter.

Following the existing alignment of paved and unpaved roadways, the total length of the Bypass from 4th Avenue north of I-10 in Blythe to I-40 at Ludlow is equal to **129 miles** of which **71 miles is unpaved** but graded to a width of two-lane roadway. The **58 miles of paved** roadway consists of 14 miles over Midland Road, 4 miles over SR-62, and 40 miles over the National Trails Highway (previously known as Route 66).

The **Kelbaker Road alternative** involves **11 miles of paved** roadway to reach I-40 instead of 35 miles over the National Trails Highway. This alternative would reduce the total length of the paved roadway of the Bypass by 24 miles, making the total length of the Bypass equal to **105 miles** of which **71 miles is unpaved** roadway and **34 miles paved** roadway that consists of 14 miles over Midland Road, 4 miles over SR-62, and 5 miles over the National Trails Highway and 11 miles over Kelbaker Road.

3.2. Physical Constraints and Engineering Issues

3.2.1. Grade and Profile

The grade of the bypass is relatively flat with very minimal slope, which satisfies the Safe Design Sight Distance requirements, except near the vista point on Midland Road, where the road drops approximately fifty feet in elevation in a short distance. The grade at this point should be designed at a maximum of 6% or less, and may also require a climbing lane.

3.2.2. Drainage Issues

Rain, although infrequent in the desert area, can case significant damage to a flat desert roadway like the proposed bypass if the storm drainage system is not properly designed to transfer flash flood water from one side of the roadway to the other.

A properly engineered drainage system requires a detailed hydrology study to define location, size, and number of the natural stream lines that cross the roadway and its contributing areas to determine the maximum quantity of the flash floods. The engineering economics plays a big roll in selecting the type and number of the needed drainage structures, which in turn impact the profile of the roadway and its earthworks. In this case, and at this stage of planning, two alternative methods will be pointed out and will be used for the preliminary cost estimation:

- Raise the profile of the roadway to allow many properly sized drainage pipes to cross the roadway at the natural locations of the streams.

- Grade ditches along the sides of the roadway to redirect the storm water to natural locations of large streams where large drainage structures will be built and will match the location of existing major drainage structures of the nearby Arizona-California Rail Tracks.

(Note: According to the preliminary environmental study of this report, the USGS maps show 116 Blue Line Streams crossing the unpaved portion of the Bypass, and 37 Blue Line Streams with drainage structures crossing the paved potion of the Bypass, mainly on the National Trails Highway.)

3.2.3. Upgrading Existing Drainage Structures

The National Trails Highway (previously Route 66) between Chambless and Ludlow has approximately 37 drainage structures of various sizes. This portion of the roadway is signed limiting the allowable truck weight that can travel over these structures. It is assumed that this weight restriction is due to the inadequacy of the strength of these structures. A detailed study and field examination of these structures is needed to design adequate measures to upgrade these structures to remove the truck weight restriction. For the purpose of this planning study it has beenassumed that all of these drainage structures will be upgraded.

3.2.4. Typical Cross Sections

In the previous chapter, the Year 2025 ADT volume was forecasted, as is expected to include a relatively high percentage of heavy trucks and recreational vehicles. The traffic volume can be accommodated by two-lane roadway that is designed to allow heavy trucks to travel over its entire length.

The Caltrans Highway Design Manual specifies the geometric cross sections for Two-lane Highways for new construction as shown on **Figure 3.2**[1] and specifies the basic structural elements of the roadway as shown on **Figure 3.3**[2]. The following are some of the design parameters of the typical cross section, upon which the Bypass cost estimate was based:

[1] Highway Design Manual, Figure 307.2, Geometric Cross Sections for Two-Lane Highways (New Construction)
[2] Highway Design Manual, Figure 601.3, Basic Structural Elements of the Roadway

- Two lane highway with 3.6 meter lane width and 2.4 meter shoulder width.
- Minimum Right of Way 40 meter (Caltrans 306.1).
- AC surface section over AC treated aggregate base.

3.2.5. Railroad Crossings

The bypass will intersect railroad right-of-ways at nine crossings. Four of these crossing are controlled with gates. Appropriate signage and special railroad crossing controls to enhance visibility and safety would be implemented at all nine crossings as part of the bypass project.

3.2.6. Major Intersections

The bypass would create new and/or upgrade seven major intersections that require widening of the paved area to provide the proper left and right turn lanes, medians, and installation of warranted traffic signals.

3.2.7. Building Materials

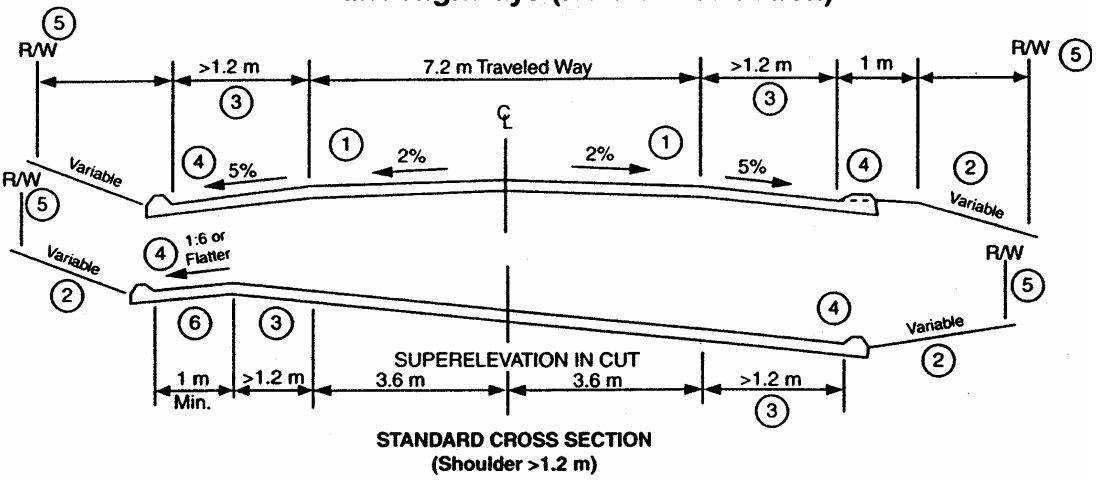
Suitable aggregates are available close to the bypass proposed alignment, but mining it or trucking it would affect the cost effectiveness for each of the four segments of the bypass. Asphalt, cement, and water must be transported and stored in suitable storage areas near newly established mixing plants or at the site where it will be used.

3.2.8. Accessibility and Traffic Control

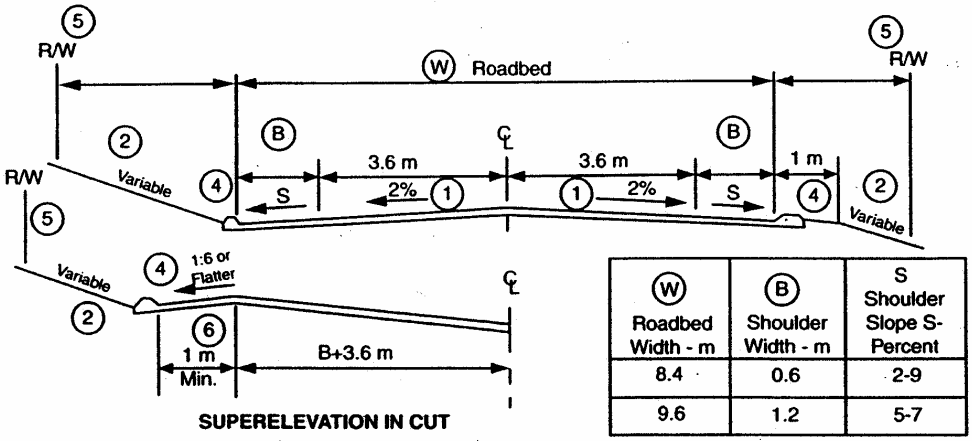
The entire length of the bypass is easily accessible by vehicles, trucks, and heavy construction equipments. And it is linked to commercial and residential areas in

Figure 3.2 - Geometric Cross Sections for Two-Lane Highways (New Construction)

Figure 307.2
Geometric Cross Sections for
Two-lane Highways (New Construction)



STANDARD CROSS SECTION
(Shoulder >1.2 m)



SUPERELEVATION IN CUT

W Roadbed Width - m	B Shoulder Width - m	S Shoulder Slope S-Percent
8.4	0.6	2-9
9.6	1.2	5-7

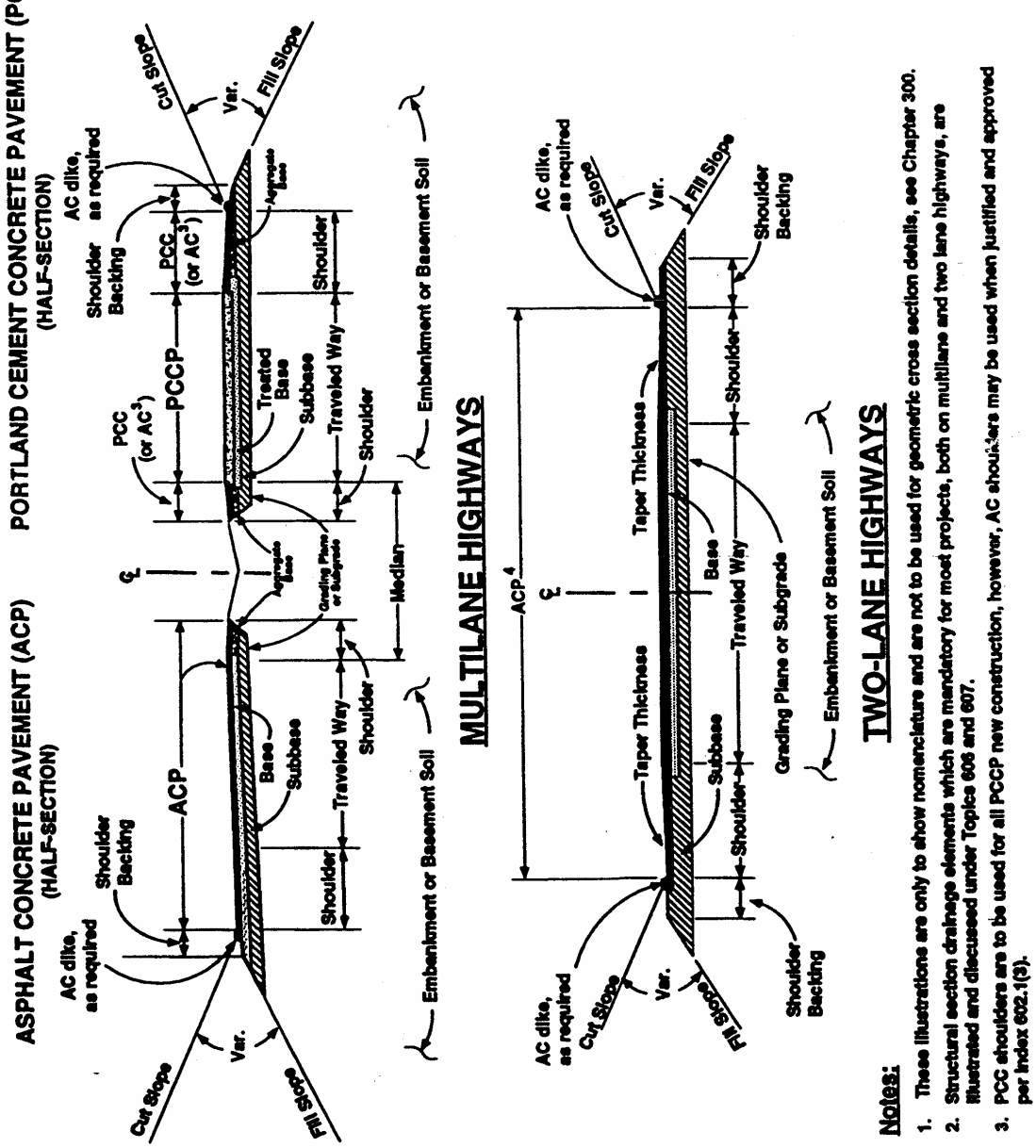
ALL PAVED CROSS SECTION
(Shoulder < 1.2 m)

NOTES	
1 CROSS SLOPES	See Index 302.2
2 SIDE SLOPES	See Index 304.1
3 SHOULDER WIDTH	See Index 302.1
4 DIKES	See Index 835.3
5 RIGHT OF WAY	See Index 306.1
6 SIDE GUTTERS	See Index 834.3(3)

Figure 3.3 – Basic Structural Elements of the Roadway

Figure 601.3

Basic Structural Elements of the Roadway



Notes:

1. These illustrations are only to show nomenclature and are not to be used for geometric cross section details, see Chapter 300.
2. Structural section drainage elements which are mandatory for most projects, both on multilane and two lane highways, are illustrated and discussed under Topics 608 and 607.
3. PCC shoulders are to be used for all PCCP new construction, however, AC shoulders may be used when justified and approved per Index 602.1(3).
4. ACP is typical, however, PCCP may be used.

towns and cities through the east-west highways of I-10, SR-62, and I-40. Standard traffic control plans are needed at the paved portions of the bypass to handle existing through traffic at construction areas, while the minimum is needed to control construction traffic at the unpaved portions of the bypass due to the non existence of through traffic.

3.2.9. Mobilization and Accommodations

Depending upon the availability and rate of funding, method of construction, and construction period, various camp sites will be planned and constructed to accommodate construction and supervision staff, mining, storing, and mixing of building materials, and to fuel and maintain construction vehicles and equipment. Although this is typical for large construction projects, the cost varies from one to another. In this case, the land is easily available, but water, fuel, and food have to be transported to the camp sites from nearby town and cities.

3.2.10. Right of Way

Although the bypass alignment was chosen to run over existing paved roads and existing unpaved roads, some additional right-of-way will need to be acquired. Due to the non existence of buildings and human inhabitants, the cost of right-of-way is expected to be relatively low because it involves vacant desert land.

3.3. Construction and Cost Estimates

At this planning stage, using the preceding information and assumptions, the following construction costs are estimated and assigned to various segments of the bypass for easy inclusion or exclusion from the total cost of the recommended alignment of the bypass.

3.3.1. Typical Cross Section

Two-lane highway as shown in Figure 307.2 of the Caltrans Highway Design Manual for truck use.

- Structural Section (pavements): $ 525 per linear meter of roadway
- Earthwork: $ 300 per linear meter of roadway

3.3.2. Drainage Structures

According to the USGS maps and the environmental assessments of this study, there are 68 existing drainage structures of various sizes along the paved segment of the bypass, mainly along the National Trails Highway, and there are 116 natural stream lines along the unpaved segment of the bypass. The existing structures need to be upgraded to accommodate Legal California Trucks. The assumption was made that 37 old and unsafe drainage structures on the National Trails Highway would be demolished and reconstructed.

- Upgrading Existing Structures: $ 85,000 per structure
- New Culverts: $ 75,000 per culvert

3.3.3. At-grade Rail Crossings

All existing railroad crossings need to be designed and upgraded to provide safe stopping distances and to include the latest control equipment to provide high visibility that increase safety for both train operators and vehicle drivers.

- At-grade Railroad Crossings: $ 250,000 per crossing

3.3.4. Major Roadway Intersections

These intersections require additional right-of-way, more pavement, traffic signals, and additional traffic handling plans during construction over the typical section of the bypass**.**

- Major Roadway Intersections: $ 500,000 per intersection

3.4. Estimated Construction Cost for the Southeastern bypass

3.4.1. First Segment

a. Typical Cross Section:
   $ 825 per meter x 14 miles x 1600 meters per mile = $ 18,480,000
b. At-grade Railroad Crossings:
   $ 250,000 per crossing x 1 crossing = $ 250,000
c. Major Roadway Intersections:
   $ 500,000 per intersection x 1 intersection = $ 500,000
d. New Drainage Culverts:
   $ 75,000 x 19 culverts = $ 1,425,000

Total First Segment = $ 20,655,000

3.4.2. Second Segment

a. Typical Cross Section:
   $ 825 per meter x 21 miles x 1600 meters per mile = $ 27,720,000
b. At-grade Railroad Crossings:
   $ 250,000 per crossing x 4 crossings = $ 1,000,000
c. Major Roadway Intersections:
   $ 500,000 per intersection x 2 intersections = $ 1,000,000
d. New Drainage Culverts:
   $ 75,000 x 40 culverts = $ 3,000,000

Total Second Segment = $ 32,720,000

3.4.3. Third Segment

a. Typical Cross Section:
   $ 825 per meter x 50 miles x 1600 meters per mile = $ 66,000,000
b. At-grade Railroad Crossings:
   $ 250,000 per crossing x 2 crossings = $ 500,000
c. Major Roadway Intersections:
   $ 500,000 per intersection x 3 intersections = $ 1,500,000
d. New Drainage Culverts:
   $ 75,000 x 76 culverts = $ 5,700,000

Total Third Segment = $ 20,655,000

3.4.4. Fourth Segment

The 40 miles over the National Trails Highway are existing two-lane roadway that is being maintained by the County of San Bernardino. Pavements and shoulders require regular scheduled maintenance; therefore it will be excluded from this cost. Drainage structures need upgrade and modification to remove the posted restriction on truck traffic.

a. At-grade Railroad Crossings:
   $ 250,000 per crossing x 2 crossings = $ 500,000
b. Major Roadway Intersections:
   $ 500,000 per intersection x 3 intersections = $ 1,500,000
c. Upgrade Existing Drainage Structures:
   $ 85,000 x 37 structures = $ 3,145,000

Total Fourth Segment = $ 5,145,000

Total Direct Cost of the four segments = $ 79,175,000

3.4.5. Overhead Costs

a. Mobilization and Camps:
   Lump Sum approximately 10% of the direct cost = $ 7,900,000
b. Major Roadway Intersections:
   Lump Sum approximately 20% of the direct cost = $ 15,000,000
c. Upgrade Existing Drainage Structures:
   Lump Sum approximately 20% of the direct cost = $ 15,000,000

Total of Overhead Costs = $ 37,900,000

Total Cost of the Southeastern Bypass = $ 107,075,000

3.5. Kelbaker Road Alternative

Kelbaker Road is two-lane roadway maintained by the San Bernardino County. It climbs 1500 feet in 11 miles (approximately 3% grade) while connecting the National Trails Highway to I-40. The travel distance over the National Trails Highway between Kelbaker Road and Ludlow at the I-40 is 35 miles. Therefore, this represents a short cut in travel miles to some travelers depending on the direction of their continued travel after reaching I-40 (saving of at least 24 miles of travel). Although more detailed study is needed to enable the comparison of the two alternatives that includes the decision to upgrade the cross section of both county roads in addition to the required drainage structures, at this stage the following assumptions are made to quantify the direct cost savings:

- Improve both roadways:
  - Saving in roadway improvement cost
    24 Miles x $ 300 per liner meter x 1600 meter per mile = $11,520,00
  - Saving in existing drainage structures
    Fourth Segment drainage improvements = $ 3,145,000
    Total Saving = $ 14,665,000

- No Improvements but continue maintaining both roadways:
  - Saving in roadway annual maintenance cost
    25 miles x $ 30 per liner meter x 1600 meter per mile = $1,520,00
  - Saving in existing drainage structures
    Fourth Segment drainage improvements = $ 3,145,000
    Total Saving = $ 4,665,000

3.6. Cost Comparisons of Freeway Improvements

The following costs of improvements on the congested freeway system in the vicinity of the Bypass are listed for comparison of the cost per lane mile of improvements:

- SR-210 was extended 28.2 miles from Los Angeles to San Bernardino at accost of 1.1 billion. Therefore the cost of a lane mile can be estimated to equal **$ 4.87 million**.

- Forty lane miles were added to SR-60 between Los Angeles County Line and I-15 at a cost of $40 million. Therefore the cost of a lane mile can be estimated to equal **$ 1.0 million**.

- Twenty Lane miles were added to I-10 between the Los Angeles County Line and I-15 at Ontario International Airport at a cost of $110 million. Therefore the cost of a lane mile can be estimated to equal to **$ 5.5 million.**

- SR-70 will be upgraded from a two-lane highway to an eight-lane freeway connecting Los Angeles and Riverside Counties at a cost of $200 million. Therefore the cost of a lane mile can be estimated to equal to **$ 2.56 million.**

The proposed Bypass will provide 85 miles of new two-lane roadway at an estimated cost of $110 million. Therefore the cost of a lane mile can be estimated to equals to **$ 0.65 million.**

The comparison of these unit costs indicate the general magnitude of expenditures on improving existing freeway facilities, but it does not reflect on the inconvenience to travelers during the construction periods which the Bypass does not create because it is constructed in the uninhabited areas without existing traffic.

4.0 ENVIRONMENTAL CONCERNS

The purpose of this chapter is to evaluate the potential environmental concerns of constructing the Southeast bypass. This chapter includes information that was obtained by aerial photograph interpretation, map analysis, Geographic Information System (GIS) database queries, internet database searches, document analysis (Riverside and San Bernardino County General Plans) and site reconnaissance (February 28, 2003). Considering that this project represents a linear facility over one hundred miles long, the information included herein will generally be discussed in order of location as one would travel from Blythe northwest to Ludlow.

4.1. Existing Conditions

The study area considered in this evaluation encompasses the Eastern portion of the California Mojave Desert between the communities of Blythe and Ludlow, California. Blythe is located in the northeastern portion of Riverside County at the California-Arizona border. Ludlow is located in the east-central portion of San Bernardino County approximately 92 miles from the California-Arizona border (See **Figure 4.1**).

4.1.1. Project Related Roadways

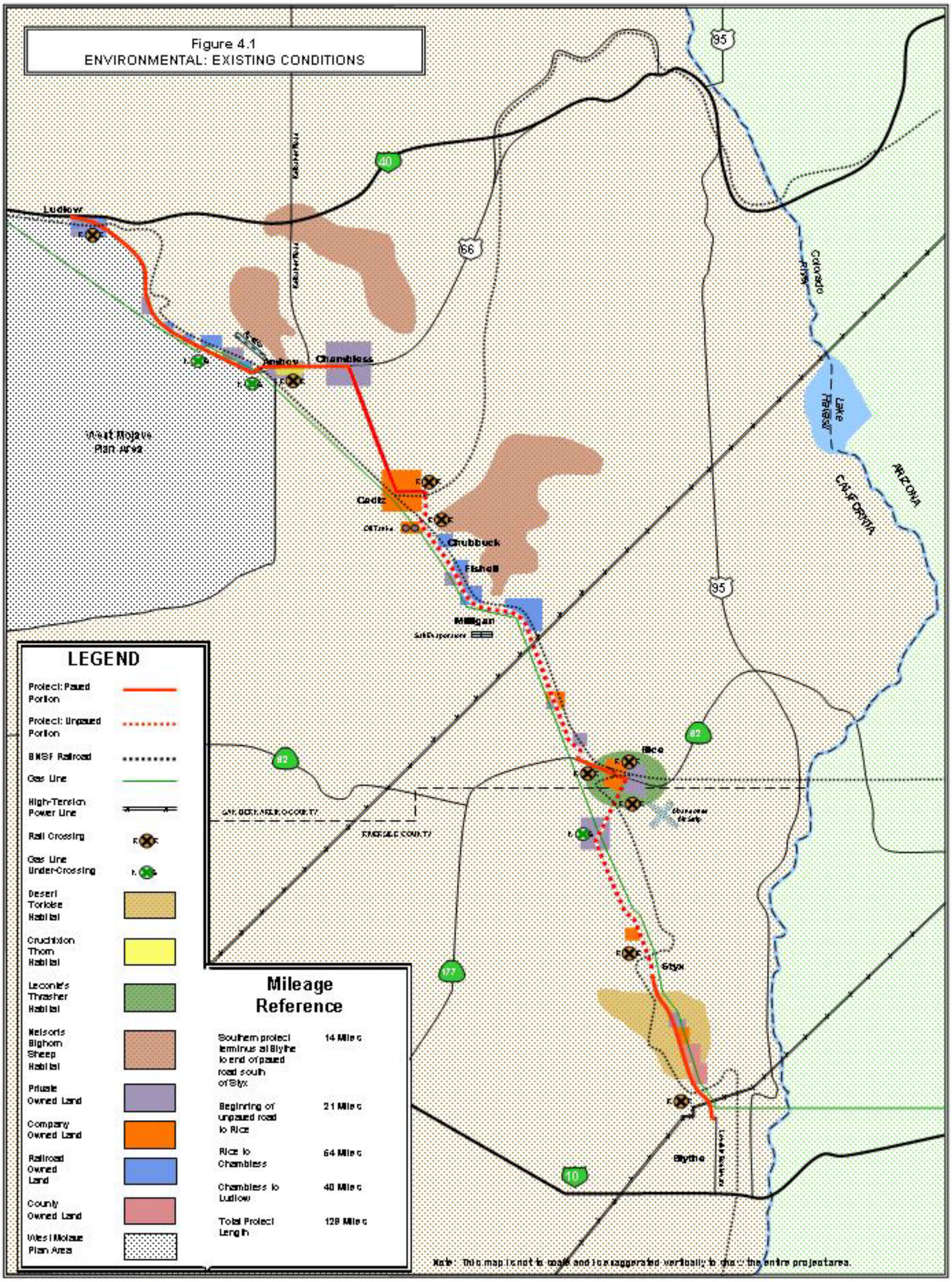
The existing roadways that would be utilized and/or converted by the project include four roadways that have been utilized for well over 20 years (as indicated by USGS maps). These roadways include:

- Midland Road: Between Blythe and State Route 62 (partially paved)
- State Route 62: Between Midland Road and Cadiz Road (paved)
- Cadiz Road: Between State Route 62 and Route 66 (unpaved)
- Route 66: Between Cadiz Road and Ludlow (paved)

4.1.2. Communities / Locations

Traveling northwest on the above listed roadways from the City of Blythe, a number of named inhabited and uninhabited locations are encountered. These locations include Blythe, Styx, Rice, Milligan, Fishel, Chubbuck, Cadiz, Chambless, Amboy, Bagdad and Ludlow. Blythe is the largest community associated with the project route, with a population of approximately 8,450 persons. Styx is a train-crossing that currently contains no structures or inhabitants. Rice is a formerly inhabited train stop community that currently contains abandoned residential and commercial structures. Milligan is an active industrial location that is currently producing salt and related products. Fishel is a location that currently contains no structures or inhabitants. Chubbuck currently contains one derelict structure that appears to be a very large oven once used for an industrial purpose.

Figure 4.1
ENVIRONMENTAL: EXISTING CONDITIONS



Cadiz is an inhabited community that currently contains a limited number of mobile homes that appear to be related to Metropolitan Water District of Southern California and Cadiz Incorporated activities[3]. Chambless and Amboy are both inhabited communities that contain residential and commercial structures, some of which appear to be closed or abandoned. Bagdad is a location that contains minimal commercial structures that consist primarily of traveler and military serving businesses. Bagdad was also the filming location for the film *Bagdad Café*. Ludlow is an inhabited community that contains residential and commercial structures. This community is the second-most commercially active community along the proposed project route, with businesses consisting mainly of traveler services.

4.1.3. Nearby Infrastructure

Existing infrastructure that is located nearby the project alignment includes an apparent gas line and a right-of-way of the Burlington Northern and Santa Fe (BNSF) railroad. These facilities closely parallel large portions of the project alignment. Based on preliminary review of the gas line and rail locations, these facilities are located within an approximate range of 100 to 1,000 feet from the project for distances of approximately 50 and 53 miles, respectively. The gas pipeline is the facility that more closely follows the project alignment. Additional existing infrastructure adjacent to the project alignment includes an oil tank facility, high-tension power lines and standard pole mounted power lines. The oil tank facility is located between Chubbuck and Cadiz. The high-tension power lines intersect the project area north of Blythe and south of Milligan. Lower voltage power lines are located along the project alignment intermittently beginning at the northwest portion of Blythe.

4.1.4. Land Ownership

Existing land ownership immediately adjacent to the project alignment includes private, large business and government ownership. Private ownership is mostly concentrated in the vicinities of Blythe, Cadiz, Chambless, Amboy and Ludlow (residential and commercial uses). Large business ownership is present primarily along the northern portion of the project, and includes the Southern Pacific Land Company, National Chloride Company of America, United States Gypsum Company and an assortment of smaller realty, financial and trust companies. Governmental ownership is present along the entire project alignment and is largely composed of federal ownership administered by the United States Bureau of Land Management (BLM). A small amount of land is owned by the County of Riverside, near the northwest portion of Blythe.

4.1.5. Topography and Vegetation

The project would traverse desert lands with topography that is primarily flat with very mild grades in the vicinities of alluvial fans. The only area of hilly topography is an approximately 50 foot rise located near Styx. Vegetation along the entire project

[3] The Metropolitan Water District of Southern California in partnership with Cadiz Incorporated is in the process of implementing activities under the Cadiz Groundwater Storage and Dry Year Supply Program (Cadiz Program).

length is primarily composed of xerophytic[4] shrubs. In drier areas, the vegetation is more sparse and widespread. However, vegetation in the drainage areas is fairly dense, and particularly dense along the drainage areas between Styx and Rice on Midland Road.

4.2. Areas of Environmental Concern

4.2.1. Aethestics

The project alignment area would exist within a landscape of primarily flat terrain containing xerophytic shrubbery, intermittent and dry streambeds, sand hills, bare earth, and gravel areas. Views of surrounding hillsides and mountains are present in all directions. The only area along the entire project alignment that is higher than the surrounding terrain is located near the location of Styx and would include an approximate fifty-foot increase in elevation. Existing night-time illumination of the project alignment is extremely limited, with minimal lighting occurring in and nearby the locations of Blythe, Cadiz, Chambless, Amboy and Ludlow.

4.2.2. Agricultural Resources

Lands located along the northern outskirts of Blythe contain Prime Farmlands, Farmlands of Statewide Importance, Farmlands of Local Importance, Unique Farmlands and Other Lands under the California Department of Conservation, Division of Land Resource Protection's Farmland Mapping and Monitoring Program. The project's southern terminus is located close to, but not within these agricultural areas.

4.2.3. Air Quality

The California Air Resources Board (CARB) and the United States Environmental Protection Agency (EPA) set air quality standards for designated areas known as air basins.

Table 4.1 – Eastern Mojave Desert Air Quality Attainment

Pollutant Standard	Attainment Rating Per County	
	San Bernardino	Riverside
State Ozone	Non-Attainment	Non-Attainment
State Carbon Monoxide	Attainment	Unclassified
State Particulate Matter Smaller Than 10 Microns	Non-Attainment	Non-Attainment
State Sulfides	Attainment	Attainment
State Hydrogen Sulfide	Attainment	Attainment
National 1 Hour Ozone	Unclassified/Attainment	Unclassified/Attainment
National Carbon Monoxide	Unclassified/Attainment	Unclassified/Attainment
National Particulate Matter Smaller Than 10 Microns	Non-Attainment	Unclassified

Source: California Air Resources Board internet web site at http://www.arb.ca.gov/desig/adm/s_ozone.html.

[4] Plant species that are adapted to living in arid habitats.

The project area is located within the Mojave Desert Air Basin. The Mojave Desert Air Basin includes portions of San Bernardino and Riverside counties. In some instances, each county may differ in its attainment status. **Table 4.1**, Eastern Mojave Desert Air Quality Attainment indicates the attainment status of the ambient air within the project area to the standards specified by the CARB and EPA.

4.2.4. Biological Resources

Traveling from Blythe northwest to Ludlow, four special status species habitat areas are either encountered or passed by. These habitat areas include those belonging to the Desert Tortoise (*Xerobates agassizii* a.k.a *Gopherus Agassizii*), Leconti's Thrasher (*Toxostoma lecontei*), Crucifixion Thorn *(Castella Emoryii)*, and Nelson's Bighorn Sheep (*Ovis canadensis nelsoni*). Additionally, a number of blue-line streams are present.

Desert Tortoise. The Desert Tortoise is listed as a "Federally Threatened" and "State Threatened" species. This reptile species is located along the project alignment between Blythe and Styx.

LeConte's Thrasher. LeConte's Thrasher is a "Federal Species of Concern," a "State Species of Concern," a BLM listed "Sensitive Species" and is also included in the United States Bird Conservation and Audubon Society watch lists. This bird species is located along the project alignment within the community of Rice.

Crucifixion Thorne. The Crucifixion Thorn is a "State Threatened" species and is also listed by the California Native Plant Society as being "Rare or Endangered in California, More Common Elsewhere." This species habitat area is located along Route 66 between Chambless and Amboy.

Nelson's Bighorn Sheep. Nelson's Bighorn Sheep, a BLM listed "Sensitive Species," is located nearby to the northeast of the project alignment between the communities of Chambless and Rice.

Jurisdictional Blue Line Streams. Blue line streams are those considered to be within the California Department of Fish and Game (CDFG) jurisdiction, thereby subject to CDFG regulation. Numerous blue line streams are present along the project alignment and would have a high potential to be impacted by the project. The CDFG utilizes USGS 7.5 minute quadrangle maps to define streams under the jurisdiction of CDFG Sections 1600-1607. A "stream" may be an intermittent or ephemeral stream, river, creek, dry wash, slough or watercourse with subsurface flows. Any stream shown as a blue line on a USGS 7.5 minute quadrangle map would fulfill this qualification. Canals, aqueducts, ditches and other forms of water conveyance may fit this qualification if the facility can or does support aquatic life, riparian vegetation and/or stream dependent terrestrial wildlife.[5] **Table 4.2**, *Blue line Streams*, indicates the number of blue line streams per USGS quadrangle map. As shown below, 68 of the blue line streams include existing over-crossings and 116 are presently unimproved.

[5] Bogdan, K. M., Cylinder, P. D., Davis, E. M. and Herson, A. I. *Wetlands Regulation*. Solano Press Books.1995.

Table 4.2 – Blue Line Streams

USGS 7.5 Minute Quad Title	Primary Direction of Travel	Blue line Streams Within USGS Quad With Existing Over-crossings	Blue line Streams Within USGS Quad Without Existing Over-crossings
Blythe Northeast[2]	SE	2	0
McCoy Wash	SE	8	0
Big Maria Mountains	SE	14	0
Inca	SE	5	2
Styx	SE	0	31
Little Maria Mountains	SSW	0	5
Rice	ESE	1	4
Arica Mountains	ESE	1	1
Sablon	SE	0	5
Danby Lake	SE	0	13
East of Milligan	SE	0	1
Milligan	SE	0	11
Chubbuck	SE	0	7
Cadiz Lake Northeast	SE	0	11
Cadiz Lake Northwest	SE	0	13
Cadiz Summit	SE	0	7
Cadiz	E	10	5
Amboy	E	10	0
Amboy Crater	ESE	7	0
Bagdad Southwest	ESE	4	0
Siberia	SE	0	0
Ash Hill	SE	4	0
Ludlow	E	2	0
Sub-Totals		68	116
Total of Project-Affected USGS Blue line Streams		**184**	

1. Sorted in direction of travel as traveling north from Blythe to Ludlow.
2. The project is assumed to terminate at the intersection of Midland Road and Lovekin Boulevard in Blythe.

4.2.5. Cultural resources

No areas of historical, archaeological and/or paleontological significance were able to be ascertained by analysis of aerial photos, maps, documents, GIS, internet, or site reconnaissance. Two areas indicated as "ruins" on USGS 7.5 quadrangle maps were noted. The first is located between the communities of Ludlow and Amboy. The second area is located at Chubbuck. During site reconnaissance it was determined that the site at Chubbuck is a derelict industrial furnace. However, the second area between Ludlow and Amboy was not able to be ascertained. Both locations were indicated on USGS maps to be within 600 feet of the project alignment. Neither of the locations were identified in the available historical, archaeological and/or paleontological resources reviewed.

4.2.6. Geology and Soils

Most of the Southern California area is considered seismically active. Maps from the California Department of Conservation and a USGS internet web site were reviewed for fault activity within the South Mojave Desert region[6,7]. Although no areas of active

[6] Jennings, C. W. 1992. *Preliminary Fault Activity Map of California*, Department of Conservation, Division of Mines and Geology.
[7] Based on review of the USGS internet web site at http://www.scecdc.scec.org/.

faults or other geological concern were shown on the maps or USGS web site, the region, as with all of Southern California, is susceptible to strong ground-shaking. Based on the available resources reviewed, landslides are located within the region. However, none are located within the project area.

4.2.7. Hazards

Potential hazards within the project area may include the above mentioned gas line, crossings at the BNSF railroad and oil tanks. Potential hazards may also include an aircraft landing strip in Amboy and ongoing travel of trucks containing hazardous materials. The gas line and oil tanks' operational status is yet to be determined. The BNSF railroad is an active railway, currently conveying goods throughout the southwestern portion of the country. During site reconnaissance, no aircraft were observed present or using the Amboy landing strip. Additionally, the volume of trucks conveying hazardous materials is unknown.

4.2.8. Hydrology and Water Quality

Numerous dikes and levees are located on the northeastern side of the project alignment and appear to be for flash flood routing. The surrounding area is composed of the typical desert sediments which include silt, sand, gravel and small cobbles. These materials provide a highly permeable substrate that allows easy percolation of surface waters into the ground.

4.2.9. Land Use

The communities along the existing project related roadways appear to have been either developed adjacent to the roadways, or adapted to their presence. These land uses include residences and traveler serving businesses (active and inactive gasoline stations, motels and restaurants).

Although special status species habitats were detected along the project route, habitat and/or natural community conservation plans were not ascertained from the available resources. However, there currently exists a proposal for a multiple-species habitat conservation area that would be located to the south of Route 66 from the Amboy area to Ludlow. This area would be called the "West Mojave Plan" area.

4.2.10. Mineral Resources

The results of aerial photo and map analysis indicate that there are two mine/quarry sites along the project alignment area. One gravel quarry is located between Blythe and Milligan to the east of the project alignment. The other is located in the vicinity of Chubbuck and is comprised of multiple small mines.

4.2.11. Noise

Based on the results of site reconnaissance, a limited number of noise sensitive receptors (residences, in this case) are located along the project alignment within the locations of Cadiz, Chambless, Amboy, Bagdad and Ludlow. Although residential and

commercial structures were observed, their occupational status was unable to be determined. Of the residences observed, some were within 200 feet from the roadway and devoid of noise attenuating barriers or vegetation.

4.2.12. Population and Housing

As indicated above under Communities/Locations and Land Ownership, a limited amount of residences and businesses exist along the project alignment. It was noted during site reconnaissance that the majority of active (based on appearance, apparent maintenance and presence of working vehicles) residences or businesses appeared to be located in the vicinities of Blythe, Cadiz, Chambless, Amboy and Ludlow.

4.2.13. Public Services

No public services were able to be ascertained from the available resources or site reconnaissance. However, it was noted during site reconnaissance that the portion of Cadiz Road from State Route 62 to Route 66 included a sign indicating that the County of San Bernardino does not maintain the roadway.

4.2.14. Recreation

The only area that could be considered a recreational area was observed to be located to the east and west of Midland Road between Blythe and Styx. The area, known as the BLM Midland Long-Term Visitor Area, was observed to contain a number of recreational vehicles, but had no formal roadways or related amenities. No other recreational areas were observed or ascertained from the available resources.

4.2.15. Transportation and Traffic

During site reconnaissance, approximately 10 vehicles were encountered along the existing roadways that would be utilized by the project. These vehicles were observed primarily on the State Route 62 and Route 66 project segment. Eleven locations of transportation and traffic related concern were noted during site reconnaissance. These areas include:

- One uncontrolled "T" intersection at Rice
- One stop sign controlled "T" intersection at Chambless
- One controlled railroad crossing at the northwest portion of Blythe on Midland Road
- One uncontrolled railroad crossing at Styx on Midland Road
- One uncontrolled railroad crossing located 1.25 miles south of Rice on Midland Road
- Two controlled railroad crossings located in Rice on State Route 162
- One uncontrolled railroad crossing located 2 miles south of Cadiz on Cadiz Road
- One controlled railroad crossing located in Cadiz on Cadiz Road
- One controlled railroad crossing located .75 mile west of Amboy on Route 66
- One controlled railroad crossing located 2.25 miles east of Ludlow on Route 66

4.2.16. Utilities and Service Systems

Utilities and Service Systems ascertained from the available resources and site reconnaissance include: high-tension power lines that cross the project alignment area between Blythe and Styx, and Rice and Milligan; the above mentioned gas-line and pole-mounted electrical/telephone lines intermittently located along the project alignment; and the improvements of the existing roadways.

4.3. Areas of Environmental Concern Potentially Affected by the Bypass

Areas of environmental concern potentially affected by the proposed project are discussed below:

1. Aesthetics. Aesthetic concerns may include the potential increase in night time momentary lighting and glare due to increased vehicle trips on the existing route. However, based on the minimal anticipated project-related traffic increase this aesthetic impact is likely to be minimal.

2. Agricultural Resources. Considering that the southern terminus of the project would be located on the northwest outskirts of Blythe away from Prime Farmlands, Farmlands of Statewide Importance, Farmlands of Local Importance, Unique Farmlands and Other Lands, agricultural severing and/or conversion by the project would likely not represent a significant impact.

3. Air Quality. Air quality issues within the project area include ozone and PM_{10}. These pollutants are prevalent in vehicle exhausts. Based on the fact that quantifiable emissions analysis is not within the scope of this analysis, quantifiable vehicle-related air quality analysis would need to be performed to determine any project-related increases. However, the project would not likely generate more trips, but would re-direct existing trips away from other routes. Based on this re-allocation of existing pollutant sources, it is expected that regional air quality would be somewhat improved. Additionally, based on the relatively modest traffic volume using the Bypass, it is not likely that localized air quality would be affected.

4. Biological Resources. The project would traverse the habitat areas of the Desert Tortoise (*Xerobates agassizii*), Leconti's Thrasher (*Toxostoma lecontei*), and Crucifixion Thorne (*Castela emoryi*). Based on this, focused biological studies would be required during subsequent environmental analysis. Although Nelson's Bighorn Sheep (*Ovis canadensis nelsoni*) habitats exist nearby to the project, but are not traversed, subsequent analysis may be required to perform studies for any indirect impacts.

5. The blue-line streams discussed above would be under the jurisdiction of the CDFG. Considering this, it is likely that wetlands delineations would be required to identify areas subject to CDFG Section 1600-1607 regulations.

6. Cultural Resources. Cultural resource concerns were not identified by analysis of available resources or site reconnaissance. Although two sites, identified as ruins on USGS maps, were observed, neither are listed in the cultural resource databases reviewed and are likely far enough away that they would not represent an environmental concern.

7. Geology and Soils. Geology and soils concerns include seismic related ground shaking and landslides. However, based on the nature of and location of the project segment, they are likely to be less than significant concerns.

8. Hazards and Hazardous Materials. The project would traverse the gas pipeline in one unpaved location, thus construction-related hazard concerns would require further analysis. The project would also intersect with the BNSF railroad at three unimproved crossings and six improved crossings; thus, traffic hazards and control features would require further analysis.

9. Hazards and hazardous materials concerns include the potential transport of agricultural-related fertilizers and pesticides along the analyzed project segment and oil storage tanks between Chubbuck and Cadiz. It is unlikely that large-scale transport of the agricultural fertilizers and pesticides would occur and the operational status of the oil tanks is yet to be determined. Considering these environmental concerns with respect to these issues would need further analysis.

10. Hydrology and Water Quality. Hydrology and water quality issues include potential drainage-related impacts with respect to the analyzed segment's requirement to construct or retrofit 184 stream over-crossings. Additional issues include flash-flood and groundwater quality concerns. However, numerous dikes and levees would provide protection to the project and it is unlikely that groundwater would be affected by vehicle-related pollutants due to the minimal amount of time that vehicles would remain in one location.

11. Land Use and Planning. Land use planning concerns would be primarily limited to determining project-related impacts with respect to CDFG Section 1600-1607 regulations on the blue line streams, and determining the presence of habitat or natural community conservation plans along the analyzed project segment.

12. Mineral Resources. Short-term mineral resource concerns would include the removal of gravel from local quarries for purposes of roadway development.

13. Noise. Noise concerns may include potential traffic increase related noise impacts to residential sensitive receptors along the project in the vicinity of Cadiz, Chambless, Amboy, Bagdad and Ludlow. However, based on the anticipated modest project related traffic increase, noise increase at these locations is not likely to noticeably exceed current levels.

14. Population and Housing. Population and housing concerns may include the potential growth inducing properties associated with improved access and economic activity afforded by the implementation of the proposed project.

15. Public Services. Public services concerns were not determined. However, implementation of the proposed project could represent an improvement in the accessibility of public services.

16. Recreation. The project would include improvements to Midland Road, northwest of Blythe. These improvements may represent a temporary construction related access concern for the BLM Midland Long-Term Visitor Center. However, the Visitor Center appears to be accessed by numerous informal entries, thus less than significant impacts are likely to occur. Additionally, the improvements to Midland Road would represent an improvement over that of existing conditions.

17. Transportation and Traffic. Transportation and traffic concerns include the two unimproved railroad crossings, six improved railroad crossings that may require upgrades, and two "T" type intersections along the analyzed project segment. Should improvements at these locations be implemented, it is likely that these concerns would be minimal.

18. Utilities and Service Systems. Utilities and service systems concerns may include the potential for the development of new drainage structures associated with the project-required new and retrofitted stream over-crossings.

5.0 CONCLUSIONS

The Southeastern Bypass Study revealed that the recommended alignment that connects the three east-west highways (I-10, SR-62, and I-40) between Blythe and Ludlow is:

- **Feasible** because it follows an existing road alignment over relatively flat terrain with minimal engineering constraints, and at this stage there do not appear to be any major environmental constraints. It is anticipated that any potentially significant impacts could likely be mitigated to a level below significance. It is not possible to determine the costs of potential mitigation measures at this stage of project development.
- **Useful** because it would attract traffic away from the Coachella Valley and congested freeway system in western Riverside and San Bernardino Counties.
- **Cost Effective** because it will be constructed mainly over existing right-of-way with flat terrain in an uninhabited area. Its unit cost would be less than other roadway capacity improvements.
- **Beneficial** because it will help in reducing congestion and air pollution in the eastern part of the greater Los Angeles metropolitan area. It could be used as a bypass of the metropolitan area in emergencies and during construction periods of adding roadway capacity to the existing freeways.

It is recommended that the Southeastern Bypass Route be adopted by CVAG and SANBAG, so that subsequent steps, including design and environmental documentation, can be undertaken.

6.0 APPENDIX

Appendix 6.1
LOW SCENARIO
Environmental Benefits: Change in Criteria Pollutant and Precursor Emissions: 2001 and 2025

				Distance		Regional VMT/year (millions)		Emission Factor (g/mi)				Annual Emissions (tons)								Change in Emissions (tons per year)				Energy Consumption	Change in BTU/ year (millions)	Change in Gasoline (auto)/ Diesel (trucks)	CO2 Consumption	Change in CO2 Emissions/year
												Baseline (w/o Bypass)				Build (with Bypass)				Build vs. Baseline								
		Vehicle Class	ADT	w/o bypass	bypass	Baseline (w/o Bypass)	Build (with Bypass)	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	(BTU/Veh-mile)	Build vs. Baseline	Build vs. Baseline	(Tons CO2/ Million BTU)	New Starts Build vs. New Starts Baseline
1998	Blythe to North/Central California	Passenger Veh. (LDV/LDT)	225	323	300	0.073	0.068	2.88	0.57	0.14	0.00	0.23	0.05	0.01	0.00	0.21	0.04	0.01	0.00	-0.02	0.00	0.00	0.00	6233	-31.6219138	-255.02	0.0765	-2.419076406
		Heavy-Duty Vehicle	823			0.265	0.247	6.19	10.04	1.00	0.67	1.81	2.93	0.29	0.20	1.68	2.73	0.27	0.18	-0.13	-0.20	-0.02	-0.01	22046	-408.6989773	-2940.28	0.0788	-32.20547941
		Total	1,048																	-0.14	-0.21	-0.02	-0.01		-440.3208911	-3195.30		-34.62455582
	Blythe to High Desert	Passenger Veh. (LDV/LDT)	19	252	255	0.005	0.005	2.88	0.57	0.14	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6233	0.418378906	3.37	0.0765	0.032005986
		Heavy-Duty Vehicle	7			0.002	0.002	6.19	10.04	1.00	0.67	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	22046	0.521762682	3.75	0.0788	0.041114899
		Total	26																	0.00	0.00	0.00	0.00		0.940141588	7.13		0.073120886
	Yuma to North/Central California	Passenger Veh. (LDV/LDT)	0	323	300	-	-	2.88	0.57	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6233	0	0.00	0.0765	0
		Heavy-Duty Vehicle	0			-	-	6.19	10.04	1.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22046	0	0.00	0.0788	0
		Total	0																	0.00	0.00	0.00	0.00		0	0.00		0
2025	Blythe to North/Central California	Passenger Veh. (LDV/LDT)	538	323	300	0.174	0.162	2.88	0.57	0.14	0.00	0.55	0.11	0.03	0.00	0.51	0.10	0.02	0.00	-0.04	-0.01	0.00	0.00	6233	-75.57637399	-609.49	0.0765	-5.781592611
		Heavy-Duty Vehicle	1,124			0.363	0.337	6.19	10.04	1.00	0.67	2.47	4.01	0.40	0.27	2.30	3.73	0.37	0.25	-0.17	-0.28	-0.03	-0.02	22046	-558.2828031	-4016.42	0.0788	-43.99268488
		Total	1,663																	-0.21	-0.29	-0.03	-0.02		-633.859177	-4625.91		-49.77427749
	Blythe to High Desert	Passenger Veh. (LDV/LDT)	46	252	255	0.012	0.012	2.88	0.57	0.14	0.00	0.04	0.01	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	6233	0.999925584	8.06	0.0765	0.076494307
		Heavy-Duty Vehicle	9			0.002	0.002	6.19	10.04	1.00	0.67	0.02	0.03	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	22046	0.712727824	5.13	0.0788	0.056162953
		Total	56																	0.00	0.00	0.00	0.00		1.712653408	13.19		0.13265726
	Yuma to North/Central California	Passenger Veh. (LDV/LDT)	0	323	300	-	-	2.88	0.57	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6233	0	0.00	0.0765	0
		Heavy-Duty Vehicle	0			-	-	6.19	10.04	1.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22046	0	0.00	0.0788	0
		Total	0																	0.00	0.00	0.00	0.00		0	0.00		0

Note:
Private vehicle classes should be consistent with regional travel model -- examples are shown here.

Source:
- Private vehicles from regional travel demand model
- Bus and rail from system operating plans

Source:
- Private vehicles from regional travel demand model
- Bus and rail from system operating plans

Source:
- Private vehicles and Heavy Duty Diesal Trucks from EMFAC vehicles traveling at 45mph

Calculation:
= VMT (millions) * 1,000,000 * Emission Factor / 909,000 g/ton

Calculation:
= New Start Emissions - Baseline Emissions

Source:
Transportation Energy Data Book Edition 16
Note:
Transit agencies may provide their own estimates for transit vehicle BTU/mi factors(provide documentation)

Calculation:
= Change in VMT/year * BTU/veh-mi

Source:
1 gallon gasoline = 124,000BTU
1 gallon of diesel fuel = 139,000 BTU
Energy Information Administration (US Dept of Energy).

Source:
Calculations by Cambridge Systematics, Inc. based on Energy Information Administration (1996) and Delucchi (1996).

Calculation:
= Change in BTU/year * Tons CO2/million BTU

Appendix 6.2
HIGH SCENARIO
Environmental Benefits: Change in Criteria Pollutant and Precursor Emissions: 2001 and 2025

				Distance		Regional VMT/year (millions)		Emission Factor (g/mi)				Annual Emissions (tons)								Change in Emissions (tons per year)				Energy Consumption	Change in BTU/ year (millions)	Change in Gasoline (auto)/ Diesel (trucks)	CO2 Consumption	Change in CO2 Emissions/year
												Baseline (w/o Bypass)				Build (with Bypass)				Build vs. Baseline								
		Vehicle Class	ADT	w/o bypass	bypass	Baseline (w/o Bypass)	Build (with Bypass)	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	(BTU/Veh-mile)	Build vs. Baseline	Build vs. Baseline	(Tons CO2/ Million BTU)	New Starts Build vs. New Starts Baseline
1998	Blythe to North/Central California	Passenger Veh. (LDV/LDT)	225	323	300	0.073	0.068	2.88	0.57	0.14	0.00	0.23	0.05	0.01	0.00	0.21	0.04	0.01	0.00	-0.02	0.00	0.00	0.00	6233	-31.6219138	-255.02	0.0765	-2.419076406
		Heavy-Duty Vehicle	2,284			0.737	0.685	6.19	10.04	1.00	0.67	5.02	8.14	0.81	0.54	4.67	7.57	0.75	0.51	-0.35	-0.57	-0.06	-0.04	22046	-1134.139662	-8159.28	0.0788	-89.37020538
		Total	2,510																	-0.37	-0.57	-0.06	-0.04		-1165.761576	-8414.29		-91.78928178
	Blythe to High Desert	Passenger Veh. (LDV/LDT)	19	252	255	0.005	0.005	2.88	0.57	0.14	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6233	0.418378906	3.37	0.0765	0.032005986
		Heavy-Duty Vehicle	93			0.023	0.024	6.19	10.04	1.00	0.67	0.16	0.26	0.03	0.02	0.16	0.26	0.03	0.02	0.00	0.00	0.00	0.00	22046	7.043796207	50.67	0.0788	0.555051141
		Total	112																	0.00	0.00	0.00	0.00		7.462175113	54.05		0.587057127
	Yuma to North/Central California	Passenger Veh. (LDV/LDT)	255	323	300	0.082	0.076	2.88	0.57	0.14	0.00	0.26	0.05	0.01	0.00	0.24	0.05	0.01	0.00	-0.02	0.00	0.00	0.00	6233	-35.72344222	-288.09	0.0765	-2.73284333
		Heavy-Duty Vehicle	328			0.106	0.098	6.19	10.04	1.00	0.67	0.72	1.17	0.12	0.08	0.67	1.09	0.11	0.07	-0.05	-0.08	-0.01	-0.01	22046	-162.8441018	-1171.54	0.0788	-12.83211522
		Total	583																	-0.07	-0.09	-0.01	-0.01		-198.567544	-1459.63		-15.56495855
2025	Blythe to North/Central California	Passenger Veh. (LDV/LDT)	538	323	300	0.174	0.162	2.88	0.57	0.14	0.00	0.55	0.11	0.03	0.00	0.51	0.10	0.02	0.00	-0.04	-0.01	0.00	0.00	6233	-75.57637399	-609.49	0.0765	-5.781592611
		Heavy-Duty Vehicle	4,772			1.539	1.432	6.19	10.04	1.00	0.67	10.48	17.00	1.69	1.13	9.75	15.81	1.57	1.06	-0.73	-1.19	-0.12	-0.08	22046	-2369.217754	-17044.73	0.0788	-186.694359
		Total	5,310																	-0.77	-1.19	-0.12	-0.08		-2444.794128	-17654.22		-192.4759516
	Blythe to High Desert	Passenger Veh. (LDV/LDT)	46	252	255	0.012	0.012	2.88	0.57	0.14	0.00	0.04	0.01	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	6233	0.999925584	8.06	0.0765	0.076494307
		Heavy-Duty Vehicle	193			0.049	0.049	6.19	10.04	1.00	0.67	0.33	0.54	0.05	0.04	0.34	0.54	0.05	0.04	0.00	0.01	0.00	0.00	22046	14.71449028	105.86	0.0788	1.159501834
		Total	240																	0.01	0.01	0.00	0.00		15.71441586	113.92		1.235996141
	Yuma to North/Central California	Passenger Veh. (LDV/LDT)	477	323	300	0.154	0.143	2.88	0.57	0.14	0.00	0.49	0.10	0.02	0.00	0.45	0.09	0.02	0.00	-0.03	-0.01	0.00	0.00	6233	-66.91000728	-539.60	0.0765	-5.118615557
		Heavy-Duty Vehicle	630			0.203	0.189	6.19	10.04	1.00	0.67	1.38	2.24	0.22	0.15	1.29	2.09	0.21	0.14	-0.10	-0.16	-0.02	-0.01	22046	-312.6606754	-2249.36	0.0788	-24.63766122
		Total	1,106																	-0.13	-0.16	-0.02	-0.01		-379.5706827	-2788.95		-29.75627678

Note:
Private vehicle classes should be consistent with regional travel model -- examples are shown here.

Source:
- Private vehicles from regional travel demand model
- Bus and rail from system operating plans

Source:
- Private vehicles from regional travel demand model
- Bus and rail from system operating plans

Source:
- Private vehicles and Heavy Duty Diesal Trucks from EMFAC vehicles traveling at 45mph

Calculation:
= VMT (millions) * 1,000,000 * Emission Factor / 909,000 g/ton

Calculation:
= New Start Emissions - Baseline Emission

Source:
Transportation Energy Data Book Edition 16
Note:
Transit agencies may provide their own estimates for transit vehicle BTU/mi factors(provide documentation)

Calculation:
= Change in VMT/year * BTU/veh-mi

Source:
1 gallon gasoline = 124,000BTU
1 gallon of diesel fuel = 139,000 BTU
Energy Information Administration (US Dept of Energy).

Source:
Calculations by Cambridge Systematics, Inc. based on Energy Information Administration (1996) and Delucchi (1996).

Calculation:
= Change in BTU/year * Tons CO2/million BTU